IN-HOUSE COMPUTERIZATION OF GEOCHEMICAL DATA

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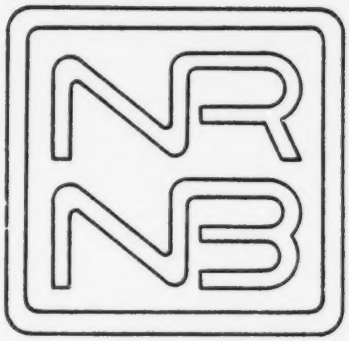

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NOTE

This is one of the "New Series" of Open File Reports issued by Mineral Resources Division. This series will have a minimum amount of editing and will include the following: (a) collections of statistical data with no accompanying report (b) collections of data associated with, but not to be included in, a formal report (c) unfinished manuscripts (d) computerized data (e) data that will be updated periodically.

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1. INTRODUCTION

1.1 A computerized system of reading,storing and retrieving of geochemical data has been established at the Mineral Resources Division.This system takes into consideration the statistical manipulation of the data and ,as well, allows for graphic display on screen and hard copies on paper and mylar. The system is partly interactive with command lists (c-lists) prompting operator responses to specific questions.

This report is intended as a user's guide to the system and discusses data input procedures,file editing and finally map creation using the plotting facilities at the University of New Brunswick.

All computer programs making up this system are available to outside users who must establish a computer account at the University of New Brunswick.

2. GEOCHEMISTRY CODING FORM

2.1 Data Input Format (Coding form,Figure 1).

An example of the input coding sheet is shown in figure 1. Data input procedures are described in Appendix I.
The coding sheet is divided into 21 Columns,the first of which, Field Sample Number,is not entered as part of the computer file. Each column of input data is described below.

2.2 Field Sample Number.

The field sample number is often alphanumeric with no fixed format or style.It is preferred by collectors of the soil samples because it allows flexibility of numbering especially where several members collect data in the same area or within the same map sheet.The Field Sample Number is maintained through the period of drying,weighing and analysis.All residues are stored under this numbering scheme as well.This procedure is necessary to ensure the reliability of sample data in the coding sheet (Figure 1.).

2.3 YR. Year of Sampling (Columns 1 and 2 of Coding Form).

Year of sample collection is entered in Columns 1 and 2.This allows for retrieval of data by 'year'.

2.4 Map Code (Columns 3 to 6 of Coding Form).

The computerized system is designed to store data by 1:20,000 scale map sheets but allows for retrieval at any scale.Each 1:50,000 map sheet in New Brunswick is assigned a unique map code which utilizes the latitude and longitude of the lower right corner

D.N.R GEOCHEMISTRY CODING FORM

PAGE____ OF ____

GEOCHEMIST ____ MAP SHEET ____ MAP CODE ____ DATE ____

BOTTOM LATITUDE ____ LEFT LONG. ____ RIGHT LONG. ____

FIELD SAMPLE NUMBER	YR	MAP CODE	SAMPLE NO.	LATITUDE	LONGITUDE	RX TYPE	AGE	CLAS	CU	PB	ZN	MN	FE %	CO	NI	AG	MO	U	W	SB
	1 2	3 6	7 9	10 16	17 24	25	26 27	28	29 30	31 34	35 38	39 42	43 48	49 52	53 56	57 60	61 64	65 68	69 72	73 76

J_0

FIGURE 1. Geochemisty coding form for input data.

of every 1 deg. x 1 deg. quadrangle.Each such quadrangle is made up o 8 - 1:50,000 maps in the N.T.S.system.The last digit of the lower latitude (Figure 2) is taken as the first code digit (47).The last digit of the right longitude is taken as the second digit (67). Going counter clockwise from the bottom right corner each 1 deg. x 1 deg. quadrangle is divided into 8 blocks (each an N.T.S. 1:50,000 sheet) which are assigned the third digit in the code (Figure 2).

Each 1:50,000 sheet is then further divided into 8 - 1:20,000 sheets (Figure 2).The division here ,however, is clockwise starting from the bottom right.By convention,these sheets are assigned the alphabetic characters a,b,c,d,e,f,g and h.In our scheme used for identifying these sheets,the alphabetic characters are assigned numbers 1 to 8 ,respectively, which become the last digit in the four digit map code of Columns 3 - 6 in the code form.

This scheme of identification of map sheet may seem confusing in light of numbering firstly,counter clockwise and then secondly clockwise.No better alternative was found,keeping in mind the need to use "numbers" in the code.

2.5 Sample Number (Columns 7 - 9 of Code Form).

All 'field samples' unique to each 1:20,000 map sheet (Map Code) are then arbitrarily assigned a new sample number which is tagged on to the map code.Renumbering starts from 01 to 999.This scheme allows for the compilation of new data at any future time. In this way,alphanumeric numbers in the 'field sample' Columns will not lead to several samples having the same identification on the published maps.

2.6 Latitude and Longitude (Columns 10 - 24 of Code Form).

The latitude and longitude are entered in decimals of a degree (to 4 decimal places).By convention,a negative sign is used before the longitude to denote its position East of Greenwich.

Latitude and Longitude of each sample location is obtained by manual digitization.The sides of each 1:20,000 map are 7.25 min. (0.125 deg.) of longitude and latitude,respectively.In order to facilitate manual digitization,each map is gridded to a .01 deg. x .01 deg. matrix (Figure 3) with the bottom right hand corner as the origin.Each sample can be located to maximum latitude and longitude of .1250 and .1250 (deg.).To obtain the last two decimal places in the .01 deg. x .01 deg. matrix,a smaller graticule (Figure 3) is placed with its centre at the sample location and its sides held parallel to the .01 deg. x .01 deg. grid lines.The last two decimal places of the position are then read directly off the graticule.

The digitizing process is fairly rapid.Each 1:20,000 map sheet can be digitized in one day.The digitized latitude and longitude values (maximum .1250,.1250 and minimum 0.000,0.000)

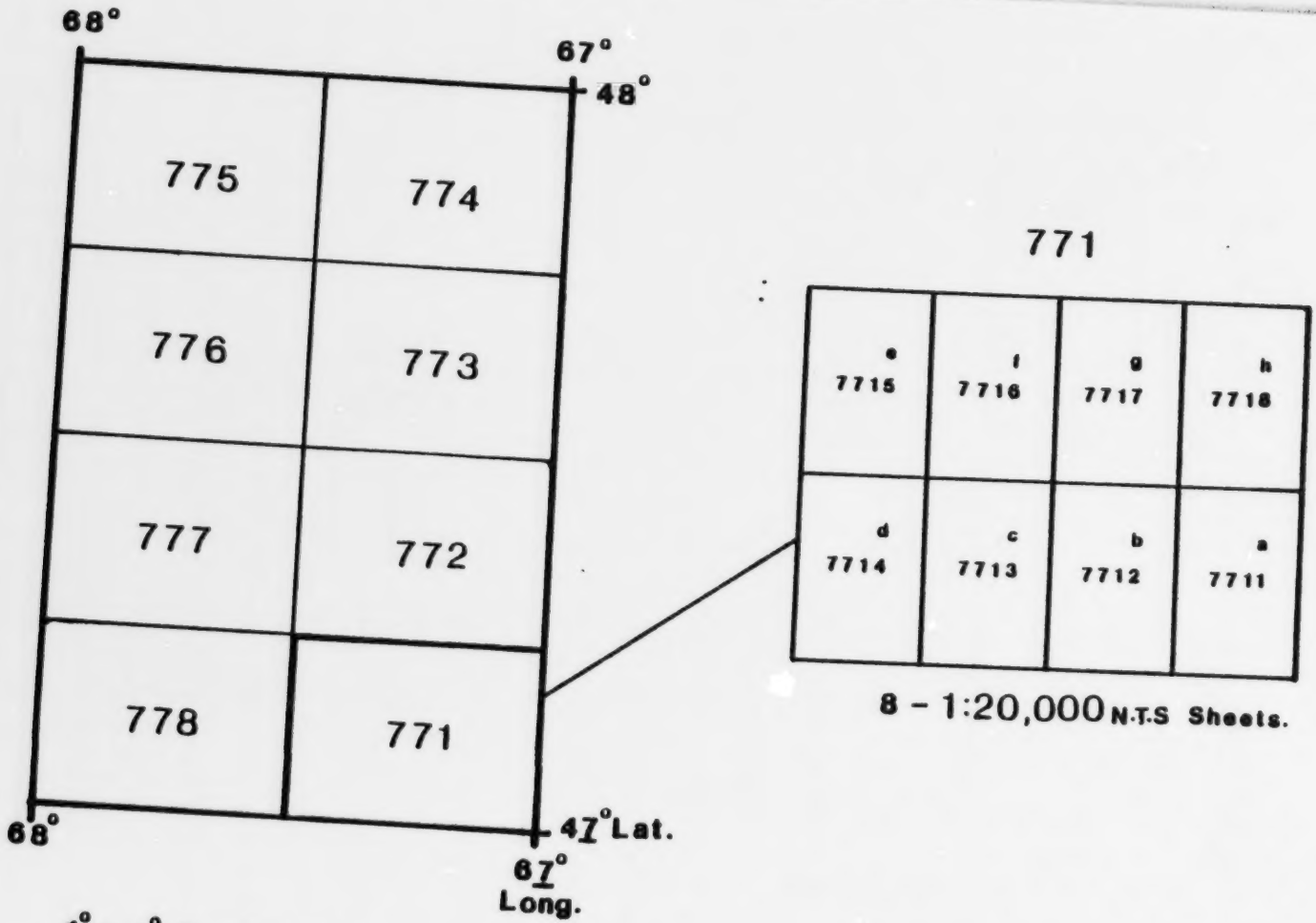


FIGURE 2. Illustration showing the derivation of numeric computer codes which are used for the identification of data sets (by 1:20,000 map sheets).

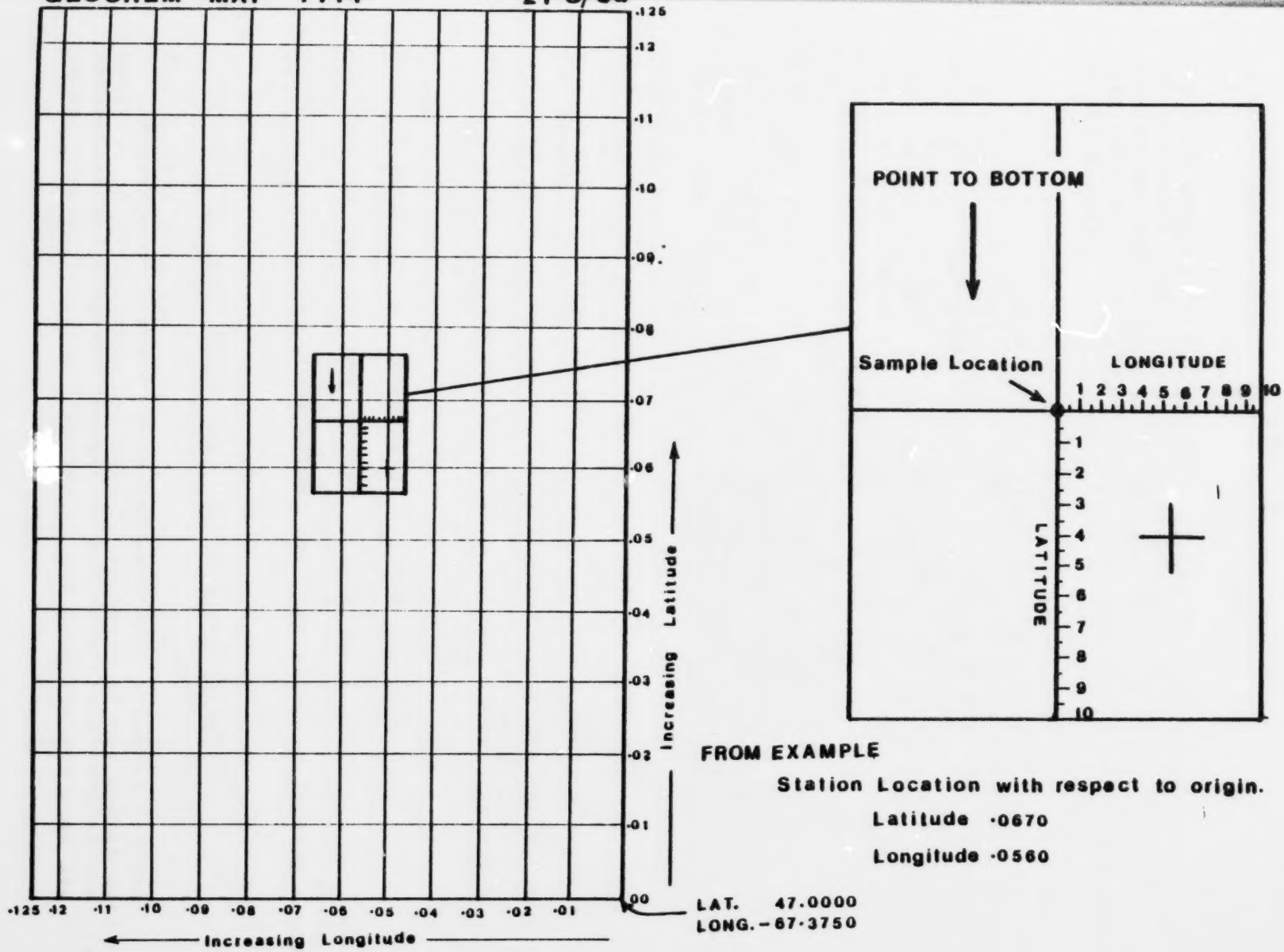


FIGURE 3. Illustration depicting method of manual digitizing of sample location.

are then entered in Columns 13 - 16 and 21 - 24,respectively. The corrected true latitude and longitude are added later by running the ADDLAT program which adds the true latitude and longitude of the origin of the digitized grid (bottom right corner of map sheet).

2.7 Rock Type (Columns 25 - 26 of the Code Form).

This code 'RX TYPE' is used to identify the bedrock type in the area of the soil sample.It is intended as a source parameter which may or may not be used in evaluating the significance of the soil anomaly.As many as 99 types of bedrock can be accomodated in this column.In the 1982 data,the unavailability of appropriate scale geologic maps prevented the coding of RX TYPE.However,a typical coding sequence shown in Table 1 can be used.

2.8 Age (Columns 27 - 28 of the Code Form).

This code 'AGE' is used to identify the age of the bedrock in the area of the soil sample.It can be used as a source parameter in the evaluation of the soil sample.A total of 99 different ages can be coded.A typical coding sequence is shown in Table 2.

2.9 Class (Columns 29 - 30 of the Code Form).

This code 'CLASS' is used to identify the sample as organic or inorganic.However,as many as 99 different classes of samples can be accomodated in the code form (Table 3).

The above three codes, RX TYPE , AGE and CLASS can be used as statistical parameters in the evaluation of the significance of the element content.These codes can also be used in sorting and extracting data.

2.10 Element Codes (Columns 31 - 80 of the Code Form).

The element content of the samples are entered under the appropriate headings.All values are entered in parts per million (ppm) except for iron which is entered as a percent.The values are entered to 1 decimal place except for iron which is entered to two decimal places.

3. INPUT FILES AND PLOTTING PROGRAMS

3.1 C-list programs.

A series of computer programs have been prepared for the handling of the geochemical data files.Users of the system need not understand the programs themselves but only their purpose and their access.However,complete listings of the programs are provided in

TABLE I

LIST OF RX TYPE CODES (ROCK TYPE)

FOR THE GEOCHEMISTRY CODING FORM OF FIGURE 1

RX TYPE CODE	ROCK TYPE	RX TYPE CODE	ROCK TYPE
1	amphibolite	21	shale
2	conglomerate	22	slate
3	chert	23	siltstone
4	calc-silicate	24	syenite
5	diabase	25	ultramafic
6	dolomite	26	mafic volcanics
7	diorite	27	felsic volcanics
8	gabbro	"	?
9	granodiorite	"	?
10	greywacke	"	?
11	granite	"	?
12	hornfels	"	?
13	iron-formation	99	?
14	limestone		
15	marble		
16	orthogneiss		
17	paragneiss		
18	phyllite		
19	quartzite		
20	sandstone		

TABLE II

LIST OF AGE CODES FOR THE GEOCHEMISTRY CODING FORM OF FIGURE 1

AGE CODE	GEOLOGIC AGE
1	Archean
2	Proterozoic
3	Cambrian
4	Ordovician
5	Silurian
6	Devonian
7	Carboniferous
8	Permian
9	Triassic
10	Jurassic
11	Cretaceous
12	Paleogene
13	Neogene
14	?
15	?
"	?
"	?
99	?

TABLE III

LIST OF CLASS CODES FOR THE GEOCHEMISTRY CODING FORM OF FIGURE 1

CLASS	DESCRIPTION
1	inorganic
2	organic
3	?
4	?
5	?
"	?
"	?
99	?

Appendix II.All Job Control Language is included except for Account identification.All programs are 'PROTECTED NOREAD NOWRITE' to prevent accidental changes which may destroy their function.Many of these programs are accessed by C-LISTS which work in an interactive manner.By running the C-LISTS,the computer prompts operator responses which control the type of output required.

3.2 Data Entry Files.

Geochemistry data are entered by 1:20,000 map sheets and are sorted as separate files.Each file is made up of a number of 'Computer Code Forms' (Figure 1) and is named using the map code described in section 2.4.

Each data set is entered as a VSPC file and SAVED under map code names such as QC7714.The data entry procedure is described in detail in Appendix I.

In order to edit each file for typographical mistakes,a hard copy of the file is made.A comparison of this printout is made with the file code sheets by going through each line.Any typographical mistakes are located and the SAVED computer files are corrected.

To extract a hard copy of the QC7714 file,the following procedure is followed.

PROCEDURE 1. O - operator response
C - computer prompt

```
SUB EXTRACT QC7714 QUES                          (return)        O
JOB SUBMITTED AS CAKLQD63 2097                                   C
```

This submits a job to the computer to extract the file from the library.To find out when job 63 is finished,

PROCEDURE 2.

```
STATUS                                           (return)        O
CAKLQD63 AWAITING EXECUTION                                      C
or CAKLQD63 EXECUTING                                            C
or CAKLQD63 COMPLETED                                            C
```

When job 63 is completed the dataset is routed to a printer by,

PROCEDURE 3.

```
ROUTE 63 DS 102 CLASS A                          (return)        O
```

This routes the dataset to be printed at the computer centre.

3.3 PROGRAM ADDLAT (Appendix 1).

Purpose: This adds the appropriate latitude and longitude to the input data file created for each 1:20,000 map. As described in section 2.6, the latitudes and longitudes shown in the code form are only relative to the origin (bottom right corner) of the map sheet. This ADDLAT program therefore identifies the latitude and longitude of the bottom right corner and automatically adds them to all the latitude and longitude values of the code sheets.

PROCEDURE: 4. O - operator response
C - computer prompt

```
RUN ADDLAT                                          (return)        O
ADDLAT    02/13/84     14.21.25                                     C
ENTER FILE DATA IS TO BE READ FROM                                  C
GC7714                                              (return)        O
ENTER FILE THAT OUTPUT IS TO BE WRITTEN TO                          C
GC7714C                                             (return)        O
ENTER LOWER RIGHT LATITUDE CORRECTION                               C
47.0000                                             (return)        O
ENTER LOWER RIGHT LONGITUDE CORRECTION                              C
67.3750                                             (return)        O
STOP                                                                C
PROC. COST 0.76 ($)                                                 C
```

This program creates a data file GC7714C of corrected latitude - longitude values. The file GC7714C is automatically stored in the ACCOUNT LIBRARY.
To check for files in the library,

PROCEDURE : 5.

```
QUERY LIBRARY                                       (return)        O
```

The computer will then list all the programs and files stored in the account library.

It is possible that the GC7714C file may contain errors in the latitude and longitude Columns due to erroneous digitizing of sample locations. In order to find these position errors, a computer plot is made of the data file for the particular map sheet (section 3.4). The plot is generated to locate all samples, by sampling number only, on a 1:20,000 scale map. This plot is then compared to the original map by overlaying on a light table. Sample positions that are mislocated are noted and redigitized. Corrections are then made to the GC7714 and GC7714C files.

3.4 PROGRAM QCPLOTCL

Purpose: This program creates a plot of sample locations and/or the values of up to 3 elements on paper or mylar.It also provides a printout of data set if requested.

PROCEDURE : 6.

```
RUN QCPLOTCL                                          (return)        0
QCPLOTCL    02/13/84    14.31.01                                      C
ENTER CPU TIME (SECONDS)AND NUMBER OF LINES (THOUSANDS)               C
DEFAULT IS '10.2' I.E. 10 SECONDS 2 THOUSAND LINES                    C
                                                      (return)        0
ENTER VSPC FILE NAME,MAP SHEET NUMBER,MAP SHEET NAME                  C
QC7714C  7714  21 O/3D                                (return)        0
ENTER LAT. AND LONG.OF LOWER LEFT CORNER                              C
47.0000  67.5000                                      (return)        0
IS DATA TO BE LISTED,PLOTTED,OR BOTH? (L/P/B)                         C
DEFAULT IS 'B'                                                        C
                                                      (return)        0
ENTER UP TO THREE ELEMENTS TO BE PLOTTED                              C
IF NO VALUES ARE ENTERED ONLY THE STATION # IS PLOTTED                C
CU  PB  ZN                                            (return)        0
ENTER SCALE:1:20,000/1:50,000                                         C
DEFAULT IS '20,000'                                                   C
                                                      (return)        0
WARNING - DIFFERENT FILE TYPE MERGED                                  C
DO YOU WANT THIS JOB SUBMITTED (Y/N) DEFAULT IS 'Y'
                                                      (return)        0
```

To find out if job is completed,go through the following:

PROCEDURE : 7.

```
status                                                (return)        0
CAKLQD57  AWAITING EXECUTION                                          C
or CAKLQD57  EXECUTING                                                C
or CAKLQD57  COMPLETED                                                C
```

When the job is executed,it creates a plot file which must then be submitted to the computing centre for physical plotting. To obtain the plot file name after the job is completed we look at the job output by:

PROCEDURE : 8.

```
LOAD OUTPUT 57                                        (return)        0
READY                                                                 C
LIST 5                                                (return)        0
```

```
5              UNBPLOT.A50. CAKLGD57                                    C
```

This plot file 'UNBPLOT.A50. CAKLGD57' is then submitted using the PAPEPLOT program (Appendix II) by:

```
  PROCEDURE:9

RUN PAPEPLOT '50 57'
or
  PROCEDURE:10

RUN MYLAPLOT '50 57'
```

This automatically sends the plot file to the computer centre for plotting on paper or mylar.

3.5 PROGRAM CPLOTCL

PURPOSE: This program creates a color map for any one of the elements. Four basic colors are used.

- BLACK (all values < Mean-Std. Dev.)
- BLUE (all values < Mean (except above))
- GREEN (all values < Mean+Std. Dev. (except above))
- RED (all values > Mean+Std. Dev.)

```
  PROCEDURE:11

RUN CPLOTCL                                          (return)          0
CPLOTCL    02/14/84    13.56.42                                        C
ENTER CPU TIME (SECS.) AND NO. OF LINES (THOUSANDS)                    C
DEFAULT IS '10.2'ie 10 SECONDS 2 THOUSAND LINES                        C
                                                     (return)          0
ENTER VSPC FILE NAME,MAP SHEET NO.,MAP NAME                            C
QC7714C  7714  21 0/3D                               (return)          0
ENTER LAT. LONG. OF LOWER LEFT CORNER                                  C
47.0000  67.5000                                     (return)          0
IS DATA TO BE LISTED, PLOTTED OR BOTH? (L/P/B)
DEFAULT IS BOTH                                                        C
P                                                    (return)          0
ENTER ELEMENT TO BE PLOTTED                                            C
CU                                                   (return)          0
ENTER MEAN AND STANDARD DEVIATION                                      C
42.0   6.3                                           (return)          0
ENTER SCALE  20,000/50,000                                             C
DEFAULT IS 20,000                                                      C
                                                     (return)          0
WARNING - DIFERENT FILE TYPE MERGED                                    C
DO YOU WANT THIS JOB SUBMITTED (Y/N) DEFAULT IS 'Y'                    C
                                                     (return)          0
```

This program creates a plot file which must then be submitted for physical plotting.To find out if job is completed,

```
PROCEDURE:7

STATUS                                          (return)        0
CAKLGD83 AWAITING EXECUTION                                     C
or CAKLGD83 EXECUTING                                           C
or CAKLGD83 COMPLETED                                           C
```

When the job is completed,

```
  PROCEDURE:8

LOAD OUTPUT 83                                  (return)        0
READY                                                           C
LIST 5                                          (return)        0
5           UNBPLOT.A91. CAKLGD83                               C
```

The plot file 'UNBPLOT.A91 CAKLGD83' is then submitted using the PAPEPLOT program by,

```
  PROCEDURE:9

RUN PAPEPLOT '91 83'                            (return)        0
```

This automatically sends the plot file to the U.N.B. computing centre for physical plotting on paper.

3.6 Paper plot vs Mylar plot.

In order to submit mylar plots,the MYLAPLOT program is substituted for PAPEPLOT in sections 3.4 and 3.5 above.For a mylar plot to be executed at the computing centre (U.N.B.),several changes have to be made to the plotting device.These include paper change to mylar,and pen change.These incur time and hence cost to the user.All mylar plots must be submitted together and preferably at night.A call is made to the computer centre to notify them of incoming mylar plots.

4. STATISTICAL PROGRAMS

4.1 Program types and source.

Two basic statistical packages are utilized in this system and are known as STAT1 and STAT2 respectively.The STAT1 and STAT2 programs are taken from the BMDP Biomedical Computer Programs P-Series (1979) in which they are identified as BMDP2 and BMDP3

respectively.STAT1 and STAT2 are basically job control language required for the execution of BMDP2 and BMDP3 with the input format controlled by the geochemistry coding form (Figure 1).

4.2 Program STAT1 (BMDP2)

The STAT1 program calculates the following parameters for each of the elements of the data set:mean,median,mode,maximum, minimum,range,variance and standard deviation (Figure 4).It divides the data set (per element) into count cells to determine the frequency distribution which is then plotted.Skewness,kurtosis and quartile values Q1 and Q3 are also calculated and displayed. (Figure 4)

4.3 Program STAT2 (BMDP3)

The STAT2 program compares two variables at a time.In this scheme it is set up to deal only with organic and inorganic samples.For the program to work with other classes and other variables such as RX TYPE and AGE,modifications have to be made to the input format of the main program (STAT2 line 90).Also, all the data files have to be sorted to allow access to specific codes (Columns of data).

The STAT2 program compares the elemental values of organic samples versus inorganic samples (Figure 5).The following parameters are calculated for each group:mean,standard deviation, maximum,and minimum.The frequency distribution of each group of data is also determined and plotted (Figure 5).

To execute the STAT1 or STAT2 program for a particular file of geochemical data such as GC7714,the following procedure is followed:

PROCEDURE:12

```
RUN STATCL                                          (return)          0
STATCL    02/4/84    13.56.42                                         C
ENTER VSPC FILE NAME,MAP SHEET NO.,MAP NAME                           C
GC7714 7714 21 0/3D                                 (return)          0
DO YOU WANT STAT1 OR STAT2 (1/2)?                                     C
DEFAULT IS STAT1                                                      C
2                                                   (return)          0
DO YOU WANT THIS JOB SUBMITTED (Y/N) DEFAULT IS 'Y'                   C
                                                    (return)          0
```

To find out if the job is completed, PROCEDURE 7 is followed.When the job is completed,

PROCEDURE:13

```
BMDP2D GEOCHEMISTRY STATISTICAL ANALYSES  INCLUDES ALL SAMPLES FOR MAP SHEET  7713 21 O/3C

  ************
  * COPPER   *
  ************

VARIABLE NUMBER . . . . . .        2
NUMBER OF DISTINCT VALUES .       22
NUMBER OF VALUES COUNTED. .      326
NUMBER OF VALUES NOT COUNTED       0

                          MAXIMUM          22.0000000
                          MINIMUM           1.0000000
                          RANGE            21.0000000
                          VARIANCE         19.4986572
                          ST.DEV.           4.4157286
                          (Q3-Q1)/2         3.0000000
                          MX.ST.SC.         2.93
                          MN.ST.SC.        -1.83

LOCATION ESTIMATES
                                    ST.ERROR
          MEAN        9.0766869     0.2448646
          MEDIAN      9.0000000     0.2886752
          MODE        6.0000000

                                                    H
                                                  HH HH HH H
                                                  HHHHHHHHH H
                                                  HHHHHHHHH HH                EACH 'H'
                                                  HHHHHHHHH HHH             REPRESENTS
                                                  HHHHHHHHH HHHH H              3
                                                  HHHHHHHHH HHHHHH            COUNT(S)
                                                  HHHHHHHHH HHHHHH
                                                 HHHHHHHHH HHHHHH   H
                                                HHHHHHHHHH HHHHHHHHHHHH
                                               L-------------------------U

                                                 EACH '-' ABOVE =       1.0000
                                                              L=        0.0
                                                              U=       25.0000
                                               CASE NO. OF MIN. VAL. =   317
                                               CASE NO. OF MAX. VAL. =     2

                                                                        Q1=     6.0000000
                                                VALUE   VALUE/S.E.      Q3=    12.0000000
SKEWNESS                                         0.53         3.92      S-=     4.6609583
KURTOSIS                                        -0.24        -0.90      S+=    13.4924164

                                                 EACH '.' BELOW =       0.2000

  M          S      Q          M          Q     S                          M
  I.....     -.....O.....E.....3.....+.....A
  N          D      E          A                                           X
                    M          N

                    PERCENTS                   PERCENTS                   PERCENTS                   PERCENTS
 VALUE    COUNT   CELL   CUM    VALUE    COUNT  CELL   CUM    VALUE    COUNT  CELL   CUM    VALUE    COUNT  CELL   CUM
    1.        1    0.3    0.3       7.      27   8.3   41.4      13.      17   5.2   83.4      19.       3   0.9   97.5
    2.        5    1.5    1.8       8.      23   7.1   48.5      14.      13   4.0   87.4      20.       4   1.2   98.8
    3.       25    7.7    9.5       9.      25   7.7   56.1      15.      11   3.4   90.8      21.       2   0.6   99.4
    4.       25    7.7   17.2      10.      26   8.0   64.1      16.      15   4.6   95.4      22.       2   0.6  100.0
    5.       24    7.4   24.5      11.      26   8.0   72.1      17.       2   0.6   96.0
    6.       28    8.6   33.1      12.      20   6.1   78.2      18.       2   0.6   96.6
```

FIGURE 4. Example of computer output for the Statistics I (STAT1) package.

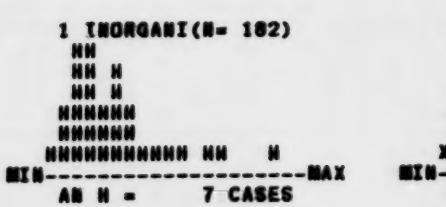
BMDP3D GEOCHEMISTRY STATISTICAL ANALYSES ORGANIC VS. INORGANIC SAMPLES FOR MAP SHEET 7728 21.0/6H

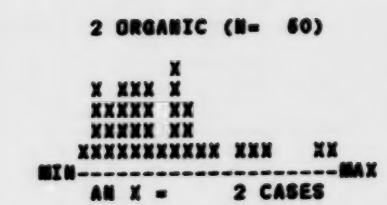
DIFFERENCES ON SINGLE VARIABLES

****
* COPPER * VARIABLE NUMBER 3
****

STATISTICS		P-VALUE	DF
T (SEPARATE)	-3.41	0.0011	70.7
T (POOLED)	-4.84	0.0000	240
F(FOR VARIANCES) LEVENE	23.84	0.0000	1, 240

GROUP	1 INORGANI	2 ORGANIC
MEAN	14.3131	18.3998
STD DEV	5.1353	9.5159
S.E.M.	0.3807	1.2286
SAMPLE SIZE	182	60
MAXIMUM	41.0000	47.0000
MINIMUM	5.0000	7.0000

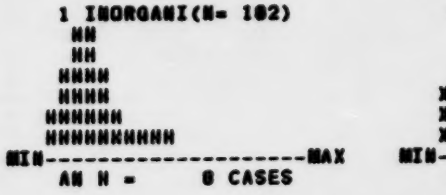


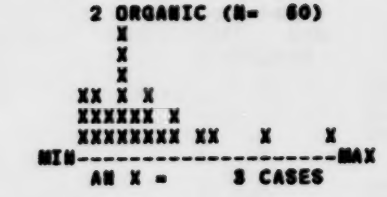


****
* LEAD * VARIABLE NUMBER 4
****

STATISTICS		P-VALUE	DF
T (SEPARATE)	-1.82	0.0738	66.0
T (POOLED)	-2.63	0.0091	240
F(FOR VARIANCES) LEVENE	27.78	0.0000	1, 240

GROUP	1 INORGANI	2 ORGANIC
MEAN	22.7961	25.4831
STD DEV	4.6935	11.1847
S.E.M.	0.3479	1.4375
SAMPLE SIZE	182	60
MAXIMUM	43.0000	76.0000
MINIMUM	12.0000	12.0000

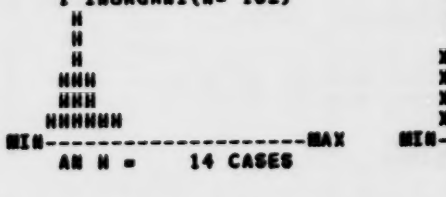


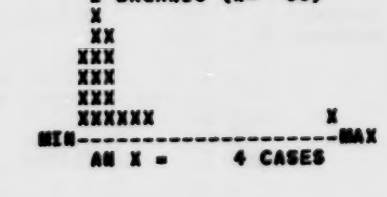


****
* ZINC * VARIABLE NUMBER 5
****

STATISTICS		P-VALUE	DF
T (SEPARATE)	1.54	0.1279	64.3
T (POOLED)	2.32	0.0210	240
F(FOR VARIANCES) LEVENE	3.46	0.0639	1, 240

GROUP	1 INORGANI	2 ORGANIC
MEAN	73.6642	64.1331
STD DEV	17.0934	46.8476
S.E.M.	1.2670	6.0480
SAMPLE SIZE	182	60
MAXIMUM	123.0000	391.0000
MINIMUM	34.0000	25.0000

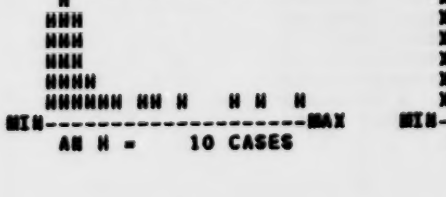




****
* MANGANES * VARIABLE NUMBER 6
****

STATISTICS		P-VALUE	DF
T (SEPARATE)	0.49	0.6285	102.6
T (POOLED)	0.47	0.6354	237
F(FOR VARIANCES) LEVENE	0.28	0.6293	1, 237

GROUP	1 INORGANI	2 ORGANIC
MEAN	904.3237	836.0986
STD DEV	967.9146	926.8047
S.E.M.	72.1441	120.6597
SAMPLE SIZE	180	59
MAXIMUM	7100.0000	5000.0000
MINIMUM	60.0000	50.0000



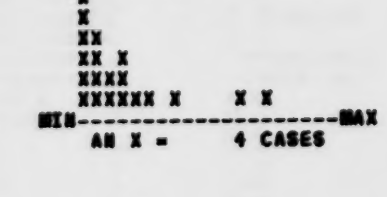


FIGURE 5. Example of computer output for the Statistics II (STAT2) package.

```
ROUTE 57 DS 102 CLASS A                    (return)        0
```

This sends the output for STAT2 to the printer at the computer centre (U.N.B.).

5. DATA SECURITY AND PROTECTION

5.1 Need For Security.

All data files in the account library need to be protected for three important reasons.The first is that the information must remain confidential until it is released to the public. Secondly,changes may accidentally be made to the data files without the knowledge of the operator.Thirdly,accidental eraser of file from the library is prevented.

5.2 Methods of Protection.

There are several ways of protecting the files as described in the VSPC MANUAL.The procedure to protect a file (e.g. GC7714) in the account library is as follows:

```
  PROCEDURE:14

PROTECT GC7714 NOREAD NOWRITE                  (return)        0
```

This prevents anyone from reading the file and also protects against anyone making changes to the data within the file.The file once protected,cannot be deleted without removing the protection. All computer programs in the account library are protected in the same way.

```
  PROCEDURE:15

PROTECT STAT1 NOREAD NOWRITE                   (return)        0
```

6. SHARING OF DATA FILES & COMPUTER PROGRAMS

6.1 Methods of Sharing Files and Programs.

After the data has been formally released to the public, requests may be made for ACCESS to data files and computer programs. In order to quickly respond to such requests,two means are available.The data files or programs can be provided as hard copies (print outs) or can be accessed by computer by the person requesting the information.

6.2 Hard Copies of PROGRAMS

The procedure for providing hard copies of computer programs

(e.g.STAT1) is as follows:

PROCEDURE:16

```
SUB EXTRACT STAT1 QUES                                (return)      0
JOB SUBMITTED AS CAKLGD58                                           C
```

After the job has been finished (PROCEDURE:7) the output (hard copy of STAT1) is submitted to the printer at U.N.B.

PROCEDURE:13

```
ROUTE 58 DS 102 CLASS A                               (return)      0
```

This routes a copy of the program to be printed at the computer centre for pick-up.

6.3 Hard Copies of DATA FILES

There are 4 ways of providing hard copies of any of the data files.Printouts can be obtained by following PROCEDURE:6 and PROCEDURE:11 described in sections 3.4 and 3.5.The EXTRACT method described above (PROCEDURE:16) can also be used to extract an unformatted hard copy which represents data as they were inputted from the coding forms.

The fourth alternative provides a neatly formatted output which is similar to the published data listings (Figure 6).The following procedure is followed to obtain a neatly formatted printout.

PROCEDURE:17

```
RUN LISTCL                                            (return)      0
LISTCL    02/4/84    13.56.42.                                      C
ENTER CPU TIME (SECS) AND NO. OF LINES (THOUSANDS)                  C
DEFAULT IS '4,2' e.g. 4 SECONDS 2 THOUSAND LINES                    C
                                                      (return)      0
ENTER VSPC FILE NAME,MAP SHEET NO.,MAP SHEET NAME                   C
QC7714 7714 31 0/3D                                   (return)      0
WARNING DIFFERENT FILE TYPE MERGED                                  C
DO YOU WANT THIS JOB SUBMITTED (Y/N) DEFAULT IS 'Y'                 C
                                                      (return)      0
```

Please note that if the listings are more than two thousand lines the response to the first prompt in PROCEDURE:17 will be 8 seconds and 4 thousand lines.

After the job is completed (PROCEDURE:7) the listings are routed to the printer at the computing centre by using PROCEDURE: 13.An example of the listing is shown in FIGURE 6.

MAP SHEET 7720 21 D/6H

YR	STATION	LAT	LONG	RX TYPE	AGE	CLASS	CU	PB	ZN	MN	FE %	CO	NI	AG	MO	U	W	SB
82	7720001	47.3982	-67.1200	0	0	1	15.0	22.0	52.0	870.0	2.92	22.0	73.0	1.0	2.0			
82	7720002	47.3765	-67.1049	0	0	1	9.0	22.0	76.0	500.0	2.51	14.0	56.0	1.0	2.0			
82	7720003	47.3789	-67.1019	0	0	1	7.0	26.0	53.0	320.0	1.62	8.0	28.0	.5	2.0	2.8		
82	7720004	47.3820	-67.1003	0	0	1	8.0	26.0	81.0	620.0	2.87	15.0	52.0	1.0	2.0			
82	7720005	47.3853	-67.0999	0	0	1	8.0	26.0	78.0	430.0	2.43	15.0	51.0	1.0	2.0			
82	7720006	47.3884	-67.0993	0	0	1	8.0	26.0	50.0	200.0	1.50	8.0	24.0	1.0	2.0	2.8		
82	7720007	47.3917	-67.1013	0	0	1	7.0	22.0	56.0	380.0	2.09	12.0	24.0	1.0	2.0			
82	7720008	47.3940	-67.0996	0	0	1	12.0	26.0	46.0	560.0	2.03	11.0	38.0	1.0	2.0			
82	7720009	47.3838	-67.1091	0	0	1	16.0	43.0	67.0	1200.0	2.36	17.0	37.0	1.0	2.0	11.2		
82	7720010	47.3798	-67.1084	0	0	1	12.0	35.0	67.0	1000.0	2.05	12.0	31.0	1.0	2.0			
82	7720011	47.3768	-67.1070	0	0	1	11.0	35.0	70.0	640.0	2.36	14.0	38.0	1.0	2.0			
82	7720012	47.3778	-67.0320	0	0	1	12.0	30.0	80.0	1600.0	2.56	19.0	55.0	1.0	2.0	3.2	8.0	
82	7720013	47.3778	-67.0303	0	0	1	10.0	30.0	87.0	1100.0	2.51	19.0	52.0	1.0	2.0		8.0	
82	7720014	47.3799	-67.0278	0	0	1	10.0	30.0	83.0	1000.0	2.66	20.0	54.0	1.0	2.0		8.0	
82	7720015	47.3818	-67.0271	0	0	1	10.0	30.0	78.0	1600.0	2.59	20.0	51.0	1.0	2.0	2.5	8.0	
82	7720016	47.3815	-67.0242	0	0	1	11.0	30.0	98.0	1000.0	3.60	27.0	73.0	1.0	2.0		4.0	
82	7720017	47.3832	-67.0220	0	0	1	12.0	26.0	83.0	900.0	3.04	22.0	63.0	1.0	2.0		8.0	
82	7720018	47.3864	-67.0088	0	0	1	9.0	20.0	94.0	1300.0	2.69	21.0	57.0	1.0	2.0	2.7	8.0	
82	7720019	47.3863	-67.0055	0	0	1	10.0	23.0	96.0	1200.0	3.07	23.0	64.0	1.0	2.0		8.0	
82	7720020	47.3839	-67.0626	0	0	1	13.0	23.0	82.0	1100.0	2.65	18.0	53.0	1.0	2.0		8.0	
82	7720021	47.3850	-67.0645	0	0	1	13.0	26.0	86.0	1400.0	2.82	20.0	59.0	1.0	2.0		8.0	
82	7720022	47.3873	-67.0653	0	0	1	13.0	23.0	100.0	1100.0	2.90	22.0	62.0	1.0	2.0	2.2	8.0	
82	7720023	47.3903	-67.0655	0	0	1	13.0	26.0	103.0	1200.0	3.03	23.0	67.0	1.0	2.0		8.0	
82	7720024	47.3819	-67.0672	0	0	1	23.0	33.0	109.0	1300.0	2.42	16.0	63.0	1.0	2.0		8.0	
82	7720025	47.3834	-67.0686	0	0	1	12.0	23.0	89.0	440.0	2.70	21.0	61.0	1.0	2.0	2.5	4.0	
82	7720026	47.3834	-67.0722	0	0	1	13.0	23.0	78.0	1200.0	2.68	19.0	55.0	1.0	2.0		8.0	
82	7720027	47.3850	-67.0722	0	0	1	10.0	20.0	85.0	760.0	2.46	18.0	55.0	1.0	2.0		8.0	
82	7720028	47.3875	-67.0732	0	0	1	10.0	20.0	83.0	820.0	2.34	18.0	50.0	1.0	2.0	2.7	8.0	
82	7720029	47.3909	-67.0719	0	0	1	10.0	20.0	78.0	670.0	2.41	18.0	52.0	1.0	2.0		8.0	
82	7720030	47.3911	-67.0740	0	0	1	13.0	23.0	78.0	800.0	2.36	16.0	51.0	1.0	2.0	3.0	8.0	
82	7720031	47.3922	-67.0776	0	0	1	21.0	36.0	123.0	1800.0	3.31	23.0	75.0	1.0	2.0		4.0	
82	7720032	47.3909	-67.0841	0	0	1	16.0	29.0	116.0	1100.0	2.70	21.0	62.0	1.0	2.0		12.0	
82	7720033	47.3942	-67.0708	0	0	1	10.0	20.0	83.0	870.0	2.54	19.0	51.0	1.0	2.0	2.3	4.0	
82	7720034	47.3971	-67.0713	0	0	1	10.0	23.0	89.0	1000.0	2.55	19.0	52.0	1.0	2.0		4.0	
82	7720035	47.3772	-67.0775	0	0	1	17.0	29.0	120.0	1300.0	3.68	27.0	75.0	1.0	2.0		8.0	
82	7720036	47.3758	-67.0512	0	0	1	13.0	25.0	83.0	1000.0	2.73	22.0	63.0	1.0	2.0		12.0	
82	7720037	47.3774	-67.0501	0	0	1	15.0	25.0	91.0	710.0	3.55	25.0	71.0	1.0	2.0		12.0	
82	7720038	47.3797	-67.0489	0	0	1	12.0	22.0	93.0	1100.0	2.84	22.0	63.0	1.0	2.0	2.6	8.0	
82	7720039	47.3830	-67.0499	0	0	1	13.0	22.0	100.0	760.0	2.87	23.0	68.0	1.0	2.0		12.0	
82	7720040	47.3848	-67.0507	0	0	1	13.0	25.0	88.0	810.0	2.59	21.0	61.0	1.0	2.0		12.0	
82	7720041	47.3864	-67.0546	0	0	1	41.0	38.0	88.0	1900.0	3.27	22.0	83.0	1.5	2.0	7.0	8.0	
82	7720042	47.3870	-67.0515	0	0	1	12.0	22.0	95.0	720.0	2.77	22.0	66.0	1.0	2.0		12.0	
82	7720043	47.3892	-67.0520	0	0	1	11.0	22.0	74.0	540.0	2.44	18.0	18.0	1.0	2.0		12.0	
82	7720044	47.3928	-67.0513	0	0	1	15.0	25.0	95.0	870.0	3.18	23.0	23.0	1.0	2.0	3.2	12.0	
82	7720045	47.3938	-67.0536	0	0	1	16.0	25.0	97.0	740.0	3.18	23.0	23.0	1.0	2.0		16.0	
82	7720046	47.3957	-67.0546	0	0	1	15.0	25.0	92.0	600.0	2.96	21.0	21.0	1.0	2.0		20.0	
82	7720047	47.3918	-67.0499	0	0	1	11.0	22.0	104.0	870.0	3.07	23.0	23.0	1.0	2.0	2.8	8.0	
82	7720048	47.3945	-67.0450	0	0	1	11.0	23.0	104.0	930.0	2.72	23.0	23.0	1.0	2.0		20.0	
82	7720049	47.3974	-67.0403	0	0	1	11.0	23.0	100.0	1000.0	2.67	23.0	62.0	1.0	2.0		20.0	
82	7720050	47.3778	-67.0580	0	0	1	12.0	23.0	86.0	1100.0	2.63	21.0	61.0	1.0	2.0		16.0	

* SAMPLE CLASS 1=INORGANIC 2= ORGANIC.
* MISSING VALUES INDICATE THAT SAMPLES WERE NOT ANALYSED FOR THAT ELEMENT.
* ALL ANALYSES ARE IN PPM EXCEPT FOR IRON WHICH IS IN PERCENT.

FIGURE 6. Example of data listing using the LISTCL program.

5.3 Access by Computer to FILES and PROGRAMS.

In order to allow computer access to data files and programs these files and programs are made ready by removing the protection placed on them.This is done as follows:

PROCEDURE:18

```
PROTECT GC7714 READ NOWRITE                    (return)    0
READY                                                      C
SHARE GC7714                                   (return)    0
```

The file GC7714 can now be read by another computer providing the other computer is given our account number.The account number is provided to the person making the request who then copies the data from our account as follows:

PROCEDURE:19

```
LOAD ACCOUNT NUMBER GC7714                     (return)    0
```

Immediately after the copy is transfered,the data file or program shared is again protected using

PROCEDURE:15

```
PROTECT GC7714 NOREAD NOWRITE                  (return)    0
```

7. CONCLUSION

This report covers the input of geochemistry data from coding forms,editing of files,preparation of basic statistics and the production of maps on paper and mylar.It does not cover the merging of file plots onto topographic maps.This stage of computerization is at its infancy and may not be available to the layman for another year.

The system here has been designed to treat data for (12) elements as shown in the coding form (Figure 1).However,it can be extended to accommodate any number of elements providing input-

output format changes are made to all the programs.One simple way of extending the capability quickly,is by using another coding form (Figure 1) but with a different suite of elements.By doing this,only name changes are required in all the supporting programs.

In order to be efficient in the use of this system,it is recommended that all users become fully acquainted with the VSPC FORTRAN TERMINAL USER'S GUIDE (IBM 1978).

ACKNOWLEDGMENTS

The authors would like to thank Joel Wallace for his invaluable help in the setting up of the computer programs.Thanks are also extended to Ron Shaw for his input into the design of the system.

REFERENCES

DIXON,W.J.AND BROWN,M.B. 1979 — BMDP-79 Biomedical Computer Programs P-Series Univ.of California Press 1979.

International Buisness Machines (IBM) 1978 — Program Product-VSPC FORTRAN Terminal User's Guide Program no. 5748-F02 (1978)

APPENDIX I

SIGN ON PROCEDURE

1. Switch on terminal and wait until cursor starts blinking.
2. Turn on MODEM.
3. Dial up the University Computing Centre on telephone and place receiver on MODEM.
4. When red light on MODEM comes on,hit 'RETURN' key twice.
5. Wait untill cursor stops blinking before entering ACCOUNT NUMBER and PASSWORD.
6. When LOGON (SIGN ON) is acknowledged,press 'BREAK' and computer will respond READY.
7. Type CLEAR on keyboard and press 'RETURN'.

You are now set for data entry or manipulation.

SIGN OFF PROCEDURE

1. Before signing off make sure that all work is SAVED or data sets may be lost.
2. Type OFF and press 'RETURN'.
3. Wait untill red light on MODEM goes out before turning instruments off.

PROCEDURE FOR INPUTTING A DATA SET

1. Follow SIGN ON PROCEDURE above.
2. Remember that data sets are inputted by individual map sheet and that each set is identified by a map code which is used for naming the data file.Refer to section 2.2 in

the main report (page 3).

3. Type CLEAR and then press 'RETURN' .Computer responds READY.

4. Type INPUT and press 'RETURN'.

5. The computer sets up the first line 00010 for inputting data.

6. Type in one line of data as per geochemistry coding form. At the end of the first line of data press 'RETURN'.

7. Computer sets up another line for data entry.Repeat line 6 above untill all data are entered.

8. To escape at any time from the 'entry' mode press 'return' twice.

9. To avoid losing data due to computer shut down,data sets should be SAVED periodically.

10. To save data files,SAVE NAME (and press return) where NAME is a unique file identifier such as QC7714.The SAVE instruction places the data set in the account library.

11. To get a file out of the account library,type LOAD NAME and press 'RETURN'.The computer responds READY.To view the file,type LIST and press 'RETURN'.

12. To add data to a file that is already SAVED,follow instructions in line 11.To add to the file,type INPUT and press 'RETURN'.The computer will set up a new file for data entry.To continue entering data go back to instructions in line 6 above.

13. Any portion of a file can be listed.To do so type LIST 570: 900 and press 'RETURN'.The computer will list only those lines requested.

14. To correct data in any line,the CHANGE instruction is used. Type CHANGE 870 '536' '563' and press 'RETURN'.The computer will go to line 870 and change the number 536 to 563.The CHANGE instruction can be used for changing all wrong values or words. e.g.
    CHANGE ALL '82' '81'.All values of 82 will be changed to 81.

15. To delete a line of data,type DELETE 570.The computer will delete line 570 when the 'RETURN' button is depressed.

16. Several lines can be deleted at once. DELETE 580:980 .This will delete lines 580 to 980 from the file.

N.B. Please consult the VSPC MANUAL for instructions not included here.

APPENDIX II

COMPUTER PROGRAMS

NAME OF PROGRAM .....ADDLAT

PURPOSE .....THIS PROGRAM TAKES A DATA SET AS INPUTTED FROM CODING SHEETS AND ADDS THE CORRECT LATITUDE AND LONGITUDE VALUES. IT THEN CREATES A NEW DATA SET OF CORRECTED VALUES AND PLACES IT IN THE ACCOUNT LIBRARY.

```
00015    &PRINT OFF NODATA NOINFO NONE
00016    &ON ERROR &RESUME
00017    &*
00018    &*  ADJUSTS LAT AND LONG VALUES OF GEOCHEM DATA
00019    &*
00020    TRANS CAPS
00021    CLEAR
00022         &TYPE ENTER FILE DATA IS TO BE READ FROM
00023    INP: &READ 10
00024         &IF &L10 = 0 &GOTO ERROR1
00025         Q FILE &10
00026         &IF &COMP GE 4 &GOTO ERROR3
00027         &TYPE ENTER FILE THAT OUTPUT IS TO BE WRITTEN TO
00028    OUT: &READ 20
00029         &IF &L20 = 0 &GOTO ERROR2
00030         Q FILE &20
00031         &IF &COMP GE 4 FILE &20 CONTENT(DATA)
00032         &IF &10 = &20 &GOTO ERROR2
00033         ALLOCATE &10 5
00034         ALLOCATE &20 10
00035         &TYPE ENTER LOWER RIGHT LATITUDE CORRECTION:
00036         &READ 30
00037         &IF &L30 = 0 &GOTO EXT
00038         &TYPE ENTER LOWER RIGHT LONGITUDE CORRECTION:
00039         &READ 40
00040         &IF &L40 = 0 &GOTO EXT
00041         INPUT
00042         &DATA
00043          LOGICAL*1 CHAR1(9),CHAR2(56)
00044          REAL LAT,LON
00045          CORLT=&30
00046          CORLN=&40
00047    10    READ(5,100,END=999) CHAR1,LAT,LON,CHAR2
00048          LAT=LAT+CORLT
00049          LON=LON+CORLN
00050          LON=-LON
00051          WRITE(10,110) CHAR1,LAT,LON,CHAR2
00052          GOTO 10
00053    999   STOP
00054    100   FORMAT(9A1,F7.4,F8.4,56A1)
00055    110   FORMAT(9A1,F7.4,F8.4,56A1)
00056          END
```

```
00057          &END ESCAPE
00058          ENTER XFORT
00059          RUN
00060      EXT: &EXIT
00061      ERROR1: &TYPE INVALID FILE NAME, REENTER
00062          &GOTO INP
00063      ERROR2: &TYPE INVALID FILE NAME, REENTER
00064          &GOTO OUT
00065      ERROR3: &TYPE FILE DOES NOT EXIST, REENTER
00066          &GOTO INP
```

NAME OF PROGRAM ..... LISTCL

PURPOSE .....PROVIDES A PRINTOUT OF DATA LIST.

```
00008    &PRINT OFF NODATA NOINFO
00009    &*
00010    &*  GEOCHEM LISTING CLIST
00011    &*
00012    TRANS CAPS
00013    CLEAR
00014         &TYPE ENTER CPU TIME (SECS) AND NUMBER OF LINES (THOUSANDS):
00015         &TYPE DEFAULT IS '4,2'  I.E. 4 SECONDS 2 THOUSAND LINES
00016         &READ 3 7
00017         &IF &L3 = 0 &SET 3 = 4
00018         &IF &L7 = 0 &SET 7 = 2
00019         INPUT
00020         &DATA
00021    //CAKLGD20 JOB '5670,XXXXXXXXXXX',CHANDRA,MSGLEVEL=(1,1)
00022    /*JOBPARM  S=&3,L=&7,NONEWS
00023         &END ESCAPE
00024    STRT:&TYPE ENTER VSPC FILE NAME, MAP SHEET NUMBER, MAP SHEET NAME:
00025         &READ 10 15 17 18
00026         &IF &L10 = 0 &GOTO ERROR1
00027         &IF &L15 = 0 &GOTO ERROR1
00028         MER LISTER
00029         INPUT
00030         &DATA
00031    &15 &17 &18
00032         &END ESCAPE
00033         MER &10
00034         INPUT
00035         &DATA
00036    //
00037         &END ESCAPE
00038         &TYPE DO YOU WANT THIS JOB SUBMITTED (Y/N) DEFAULT IS 'Y'.
00039         &READ 80
00040         &IF &L80 = 0 &SET 80 = 'Y'
00041         &IF &80  = N &GOTO OUT
00042         SUBMIT
00043    OUT: &TYPE VSPC COMMAND TRANS CAPS HAS BEEN ISSUED
00044    &EXIT
00045    ERROR1: &TYPE INVALID FILE NAME OR MAP NUMBER
00046         &GOTO STRT
00047
00048
00049
00050
00051
00052
00053
00054
00055
00056
```

NAME OF PROGRAM.....LISTER

PURPOSE.....MAIN PROGRAM FOR LISTCL
WHICH IS USED TO GENERATE
FORMATTED DATA LISTS.

```
00010    //     EXEC PLICKR
00011    //SYSPRINT DD DCB=(LRECL=133,BLKSIZE=137,RECFM=FA)
00012    //GO.SYSIN DD *
00013     LISTER:PROCEDURE OPTIONS(MAIN);
00014
00015           DCL  SYSPRINT FILE OUTPUT STREAM PRINT ENV(F BLKSIZE(137));
00016
00017           DCL  AGE                    FIXED BIN,
00018                CLS                    FIXED BIN,
00019                ELEMENTS(12)           FLOAT BIN,
00020                EOF                    BIT,
00021                ICNT                   FIXED BIN,
00022                ISTA                   FIXED BIN(31),
00023                LAT                    FLOAT BIN,
00024                LON                    FLOAT BIN,
00025                MAP                    FIXED BIN,
00026                MAPNAME                CHAR(8),
00027                RX                     FIXED BIN,
00028                YR                     FIXED BIN;
00029
00030           DCL  MOD                    BUILTIN;
00031
00032
00033           ON ENDFILE EOF='1';
00034
00035           EOF='0';
00036           ICNT=0;
00037
00038           GET EDIT(MAP,MAPNAME) (F(4),X(1),A(8));
00039
00040           DO WHILE (¬ EOF);
00041             GET SKIP EDIT(YR,ISTA,LAT,LON,RX,AGE,CLS,ELEMENTS)
00042                      (F(2),F(7),F(7,4),F(8,4),(3) F(2),
00043                      (3) F(4,1),F(6,1),F(4,2),(7) F(4,1));
00044             IF(MOD(ICNT,50) = 0)
00045             THEN DO;
00046                    PUT SKIP(2) EDIT('  *  SAMPLE CLASS  1=INORGANIC  ',
00047                       ' 2= ORGANIC.')
00048                      (A,A);
00049                    PUT SKIP(1) EDIT('  *  MISSING VALUES INDICATE THAT',
00050                       ' SAMPLES WERE NOT ANALYSED FOR THAT ELEMENT.')
00051                      (A,A);
00052                    PUT SKIP(1) EDIT('  *  ALL ANALYSES ARE IN  PPM  ',
00053                       'EXCEPT FOR  IRON WHICH IS IN PERCENT.')
00054                      (A,A);
00055                    PUT PAGE EDIT('  MAP SHEET ',MAP,MAPNAME)
00056                                 (COLUMN(5),A,F(4),X(3),A);
```

```
00057                   PUT SKIP(2) EDIT('RX') (COLUMN(37),A);
00058                   PUT SKIP EDIT(' YR  STATION    LAT      LONG    TYPE',
00059                       ' AGE CLASS   CU    PB    ZN     MM    FE %',
00060                       '   CO    MI    AG    MO    U     W     SB ')
00061                       (COLUMN(5),A,A,A)
00062                       (' ** ********  ********  ******* **** *** ',
00063                       '***** ***** ***** ***** ******* ***** ***** ',
00064                       '***** ***** ***** ***** ***** *****')
00065                       (SKIP(1),COLUMN(5),A,A,A);
00066                    PUT SKIP(1);
00067                 END;
00068            ICNT=ICNT+1;
00069            PUT SKIP EDIT(YR,ISTA,LAT,LON,RX,AGE,CLS,ELEMENTS)
00070                 (COLUMN(5),F(3),X(2),F(7),(2)F(9,4),F(4),F(5),F(5),X(1),
00071                 (5) P'ZZZZV.Z',P'ZZZZZZV.Z',P'ZZZV.ZZ',(7) P'ZZZZV.Z');
00072          END;
00073   END LISTER;
00074  *DATA;
```

NAME OF PROGRAM.....GCPLOTCL

PURPOSE.....GENERATES PLOT OF
1. SAMPLE STATION LOCATION
2. FROM ONE TO THREE ELEMENTS
IN ANY ORDER.
PROVIDES A LIST OF DATA SET.

```
00012    &PRINT OFF NODATA NOINFO
00013    &*
00014    &*  GEOCHEM PLOTTING CLIST
00015    &*
00016    TRANS CAPS
00017    CLEAR
00018         &TYPE ENTER CPU TIME (SECS) AND NUMBER OF LINES (THOUSANDS):
00019         &TYPE DEFAULT IS '10,2'  I.E. 10 SECONDS 2 THOUSAND LINES
00020         &READ &8 &7
00021         &IF &L8 = 0 &SET &8 = 10
00022         &IF &L7 = 0 &SET &7 = 2
00023         INPUT
00024         &DATA
00025    //CAKLGD46 JOB '5678,XXXXXXXXXXX',CHANDRA,MSGLEVEL=(1,1)
00026    /*JOBPARM  S=&8,L=&7,NONEWS
00027         &END ESCAPE
00028    STRT:&TYPE ENTER VSPC FILE NAME, MAP SHEET NUMBER, MAP SHEET NAME:
00029         &READ &10 &15 &17 &18
00030         &IF &L10 = 0 &GOTO ERROR1
00031         &IF &L15 = 0 &GOTO ERROR1
00032    LTLN:&TYPE ENTER LAT AND LONG OF LOWER LEFT CORNER
00033         &READ &20 &30
00034         &IF &L20 = 0 &GOTO ERROR2
00035         &IF &L30 = 0 &GOTO ERROR2
00036    PLOT:&TYPE IS DATA TO BE LISTED,PLOTTED OR BOTH? (L/P/B)
00037         &TYPE DEFAULT IS 'B'.
00038         &READ &50
00039         &IF &L50 = 0 &SET &50 = 3
00040         &IF &50  = L &SET &50 = 1
00041         &IF &50  = P &SET &50 = 2
00042         &IF &50  = B &SET &50 = 3
00043         &IF &50  = 1 &GOTO SCL
00044    VAL: &TYPE ENTER UP TO THREE ELEMENTS TO BE PLOTTED
00045         &TYPE IF NO VALUES ARE ENTERED ONLY THE STATION # IS PLOTTED.
00046         &READ &55 &56 &57
00047         &SET &54 = 3
00048         &IF &L57 = 0 &SET &54 = 2
00049         &IF &L56 = 0 &SET &54 = 1
00050         &IF &L55 = 0 &SET &54 = 0
00051         &IF &L55 = 0 &SET &55 = 1
00052         &IF &L56 = 0 &SET &56 = 1
00053         &IF &L57 = 0 &SET &57 = 1
00054         &IF &54  = 0 &GOTO SCL
00055         &IF &55 = CU &SET &55 = 1
00056         &IF &55 = PB &SET &55 = 2
```

```
00057          &IF &55 = ZN &SET 55 = 3
00058          &IF &55 = MN &SET 55 = 4
00059          &IF &55 = FE &SET 55 = 5
00060          &IF &55 = CO &SET 55 = 6
00061          &IF &55 = NI &SET 55 = 7
00062          &IF &55 = AG &SET 55 = 8
00063          &IF &55 = MO &SET 55 = 9
00064          &IF &55 = U  &SET 55 = 10
00065          &IF &55 = W  &SET 55 = 11
00066          &IF &55 = SB &SET 55 = 12
00067          &IF &56 = CU &SET 56 = 1
00068          &IF &56 = PB &SET 56 = 2
00069          &IF &56 = ZN &SET 56 = 3
00070          &IF &56 = MN &SET 56 = 4
00071          &IF &56 = FE &SET 56 = 5
00072          &IF &56 = CO &SET 56 = 6
00073          &IF &56 = NI &SET 56 = 7
00074          &IF &56 = AG &SET 56 = 8
00075          &IF &56 = MO &SET 56 = 9
00076          &IF &56 = U  &SET 56 = 10
00077          &IF &56 = W  &SET 56 = 11
00078          &IF &56 = SB &SET 56 = 12
00079          &IF &57 = CU &SET 57 = 1
00080          &IF &57 = PB &SET 57 = 2
00081          &IF &57 = ZN &SET 57 = 3
00082          &IF &57 = MN &SET 57 = 4
00083          &IF &57 = FE &SET 57 = 5
00084          &IF &57 = CO &SET 57 = 6
00085          &IF &57 = NI &SET 57 = 7
00086          &IF &57 = AG &SET 57 = 8
00087          &IF &57 = MO &SET 57 = 9
00088          &IF &57 = U  &SET 57 = 10
00089          &IF &57 = W  &SET 57 = 11
00090          &IF &57 = SB &SET 57 = 12
00091          &IF &55 < 1 &GOTO ERROR3
00092          &IF &56 < 1 &GOTO ERROR3
00093          &IF &57 < 1 &GOTO ERROR3
00094          &IF &55 > 12 &GOTO ERROR3
00095          &IF &56 > 12 &GOTO ERROR3
00096          &IF &57 > 12 &GOTO ERROR3
00097     SCL: &TYPE ENTER SCALE (20000/50000):
00098          &TYPE DEFAULT IS '20000 '
00099          &READ 60
00100          &IF &L60 = 0 &SET 60 = 20000
00101          &IF &60 = 20000 &GOTO LST
00102          &IF &L60 =50000 &GOTO LST
00103          &GOTO SCL
00104     LST: &IF &L54 = 0 &SET 54 = 0
00105          &IF &L55 = 0 &SET 55 = 1
00106          &IF &L56 = 0 &SET 56 = 1
00107          &IF &L57 = 0 &SET 57 = 1
00108          INPUT
00109          &DATA
00110     //   EXEC FORTPLOT,PARM.FORT='NOXREF,NOMAP,LANGLVL(66)',
00111     //        TYPE=FILEPLOT,RG=256K
00112     //FORT.SYSIN DD *
```

```
00113          &END ESCAPE
00114          MER PLOT1
00115          MER PLOT2
00116          INPUT
00117          &DATA
00118     //GO.SYSIN DD *
00119     &15 &20 &30 &60 &50 &54
00120     &17 &18
00121     &55 &56 &57
00122          &END ESCAPE
00123          MER &10
00124          INPUT
00125          &DATA
00126     //
00127          &END ESCAPE
00128          &TYPE DO YOU WANT THIS JOB SUBMITTED (Y/N) DEFAULT IS 'Y'.
00129          &READ &O
00130          &IF &L&O = 0 &SET &O = 'Y'
00131          &IF &&O  = N &GOTO OUT
00132          SUBMIT
00133     OUT: &TYPE VSPC COMMAND TRANS CAPS HAS BEEN ISSUED
00134     &EXIT
00135     ERROR1: &TYPE INVALID FILE NAME OR MAP NUMBER
00136          &GOTO STRT
00137     ERROR2: &TYPE INVALID NUMBER
00138          &GOTO LTLN
00139     ERROR3: &TYPE INVALID ELEMENT.
00140          &GOTO VAL
```

NAME OF PROGRAM.....PLOT1

PURPOSE .....EXECUTE PLOT INSTRUCTIONS
FROM GCPLOTCL FOR 1:50,000
AND 1:20,000
GEOCHEMISTRY MAPS.

```
00011     C     PLOT
00012           REAL LTMN,LTMX,LNMN,LNMX,LAT,LON,ELMS(12),PLT(3),PL2
00013           INTEGER CLS,NPLT,P1,P2,P3
00014           INTEGER*4 FRMT(2) /'(F7.','1)  '/
00015           INTEGER*4 FRMT2 /'(I5)'/
00016           INTEGER*4 ELMNTS(4) /'    ','    ','    ','$E  '/
00017           INTEGER*4 MPNAME(3) /'    ','    ','    ','$E  '/
00018           INTEGER*4 CHRS(12) /'CU  ','PB  ','ZN  ','MN  ','FEX ','CO  ',
00019          .     'NI  ','AG  ','MO  ','U   ','W   ','SB  '/
00020     C
00021     C
00022     C       LTMN   - MINIMUN LATITUDE OF MAP SHEET
00023     C       LNMN   - MINIMUN LONGITUDE OF MAP SHEET
00024     C       XLEN   - LENGTH OF PLOT IN CENTIMETRES ALNG THE X-AXIS
00025     C       YLEN   - LENGTH OF PLOT IN CENTIMETRES ALNG THE Y-AXIS
00026     C       ISTA   - STATION NUMBER
00027     C       LPB    - LIST,PLOT OR BOTH (1,2 OR 3)
00028     C       NPLT   - NUMBER OF VALUES TO BE PLOTTED IF ZERO ONLY THE
00029     C                STATION NUMBER IS PLOTTED
00030
00031           READ (5,*) MAP,LTMN,LNMN,ISCALE,LPB,NPLT
00032           READ(5,150) MPNAME(1),MPNAME(2)
00033           LNMN=-LNMN
00034           IF(ISCALE.EQ.50000) GOTO 2
00035           LNMX=LNMN+0.125
00036           LTMX=LTMN+0.125
00037           GOTO 4
00038         2 LNMX=LNMN+0.500
00039           LTMX=LTMN+0.250
00040     C
00041         4 READ(5,*) P1,P2,P3
00042           IF(NPLT .GE. 1) ELMNTS(1)=CHRS(P1)
00043           IF(NPLT .GE. 2) ELMNTS(2)=CHRS(P2)
00044           IF(NPLT .GE. 3) ELMNTS(3)=CHRS(P3)
00045     C
00046     C     TEST IF DATA IS TO PLOTTED OR LISTED
00047
00048           IF(LPB.EQ.1) GOTO 5
00049     C
00050     C     CALCULATE MAP BOUNDARIES AND DIMENSIONS
00051
00052           CALL MAPSZ(MAP,ISCALE,LTMN-0.02,LTMX,LNMN-0.02,LNMX,XLEN,YLEN)
00053           XLEN=XLEN/2.54
00054           YLEN=YLEN/2.54
00055           CHECK=XLEN*YLEN
00056     C     IF(YLEN.GT.33.0 .OR. CHECK.LE.0.0 .OR. XLEN.GT.50) GO TO 30
```

```
00057     C         SET PLOT LIMITS, FRAME AND LABEL MAP SHEET
00058     C
00059               CALL AREA(XLEN,YLEN)
00060               CALL SETPLT(LNMN-0.02,LTMN-0.02,LNMX,LTMX)
00061               CALL AXES(LNMN,LTMN,LNMX,LTMX,LNMX,LTMX,0.01,0.01)
00062               CALL AXES(LNMN,LTMN,LNMX,LTMX,LNMN,LTMN,0.01,0.01)
00063               X1=LNMX+0.002
00064               Y1=LTMX+0.001
00065               CALL NMBR(LNMN,Y1,LNMN,'(F7.3)')
00066               CALL NMBR(LNMX,Y1,LNMX,'(F7.3)')
00067               CALL NMBR(X1,LTMX,LTMX,'(F7.3)')
00068               CALL NMBR(X1,LTMN,LTMN,'(F7.3)')
00069               X1=LNMN+0.002
00070               Y1=LTMX+0.002
00071               CALL NMBR(X1,Y1,MAP,'(''  GEOCHEM MAP ''I4)',0.0,0.3)
00072               X1=LNMN+0.050
00073               CALL CHARS(X1,Y1,ELMNTS,0.0,0.3)
00074               X1=LNMN+0.100
00075               CALL CHARS(X1,Y1,MPNAME,0.0,0.3)
00076     C
00077        5      CONTINUE
00078     C
00079     C         READ RECORD AND PLOT IT
00080     C
00081       10      READ(5,130,END=40)
00082             . YR,ISTA,LAT,LON,RX,AGE,CLS,ELMS
00083               IF(LPB .NE. 2 .AND. MOD(ICNT,50) .EQ. 0) PRINT 105,MAP
00084               ICNT=ICNT+1
00085               IF(LPB.NE.2) PRINT 140,
00086             . YR,ISTA,LAT,LON,RX,AGE,CLS,ELMS
00087               IF(LPB .EQ. 1) GOTO 10
00088               ISYM=-CLS
00089               ISTA=MOD(ISTA,1000)
00090               PLT(1)=ELMS(P1)
00091               PLT(2)=ELMS(P2)
00092               PLT(3)=ELMS(P3)
00093               IF(LON.GT.LNMX.OR.LON.LT.LNMN) GO TO 35
00094               IF(LAT.GT.LTMX.OR.LAT.LT.LTMN) GO TO 35
00095               ISTA=MOD(ISTA,1000)
00096               CALL SPSYMB(LON,LAT,ISYM)
00097               X1=LON-0.00055
00098               Y1=LAT+0.00025
00099               CALL NMBR(X1,Y1,ISTA,'(I4)',0.0,0.07)
00100               IF(NPLT .EQ. 0) GOTO 10
00101               X1=LON-NPLT+0.0005
00102               Y1=LAT-0.00055
00103               DO 20 I=1,NPLT
00104                 PL2=PLT(I)
00105                 IF(PL2.EQ.0) CALL CHARS(X1,Y1,'NA$E',0.0,0.07,XR,YR)
00106                 IF(PL2.EQ.0.0) GOTO 15
00107                 IPL2=IFIX(PL2)
00108                 IF(PL2.NE.AINT(PL2))
00109               .    CALL NMBR(X1,Y1,PL2,FRMT,0.0,.07,1,1,1,XR,YR)
00110                 IF(PL2.EQ.AINT(PL2))
00111                    CALL NMBR(X1,Y1,IPL2,FRMT2,0.0,.07,1,1,1,XR,YR)
00112       15        IF(I.NE.NPLT)   CALL CHARS(XR,YR,'.$E',0.0,0.07,X1,Y1)
```

```
00113      20     CONTINUE
00114             GO TO 10
00115     C
00116      30     PRINT 100
00117             GO TO 40
00118      35     PRINT 110,ISTA,LAT,LON
00119             GO TO 10
00120      40     IF(LPB.NE.1) CALL ENDPLT
00121             STOP
00122     100     FORMAT(' ',' MAP TO LARGE OR PARAMETERS WRONG')
00123     105     FORMAT('1',//////,'  MAP SHEET ',I4,//'  ',
00124           .  'YR  STATION     LAT      LONG    RX TYPE AGE CLASS     CU     PB ',
00125           .  '    ZN       NN      FE %    CO     NI     AG ',
00126           .  '    MO       U       W     SB ',/'  ',
00127           .  '== ========  =======  ======= ======= === =====   ====  ====',
00128           .  ' =====  ======  ====  ====  ====  ====',
00129           .  '   ====  ====  ====  ====',/)
00130     110     FORMAT(' ',I10,5X,2F10.4,' IS OUTSIDE MAP BOUNDARIES')
00131     130     FORMAT(I2,I7,F7.4,F8.4,3I2,3F4.1,F6.1,F4.2,7F4.1)
00132     140     FORMAT(' ',I3,2X,I7.2F9.4,I5,I7,I5,2X,3F6.1,F8.1,F6.2,7F6.1)
00133     150     FORMAT(A4,A4)
00134             END
```

NAME OF PROGRAM PLOT2

PURPOSE .....THIS PROGRAM CALCULATES
THE UTM COORDINATES OF THE CORNERS
OF THE MAP AND SCALES THE APPROPRIATE
SIZE.

```
00010          SUBROUTINE MAPSZ(MAP,ISCALE,LTMN,LTMX,LNMN,LNMX,XLEN,YLEN)
00011     C
00012     C    PROGRAM MAPSZ
00013     C
00014     C
00015          IMPLICIT REAL*8 (A-H,O-Z)
00016          REAL LTMN,LTMX,LNMN,LNMX
00017          PI=DARCOS(-1.0D0)
00018          RAD= 180.0/PI
00019          A= 6378206.4D0
00020          B= 6356583.8D0
00021          XO= 500000.D0
00022          SF= 0.9996D0
00023          CM= 293.5D0
00024          CMRAD=CM/RAD
00025     C
00026          ALT1=DBLE(LTMN)/RAD
00027          ALT2=DBLE(LTMX)/RAD
00028          ALT3=(ALT1+ALT2)/2.0D0
00029          ALN1=(DBLE(360.0+LNMX)-CM)/RAD
00030          ALN2=(DBLE(360.0+LNMN)-CM)/RAD
00031          ALN3=(ALN1+ALN2)/2.0D0
00032          CALL TMPLXY(ALT1,ALN3,A,B,SF,XO,CMRAD,X1,Y1)
00033          CALL TMPLXY(ALT2,ALN3,A,B,SF,XO,CMRAD,X2,Y2)
00034          CALL TMPLXY(ALT3,ALN1,A,B,SF,XO,CMRAD,X3,Y3)
00035          CALL TMPLXY(ALT3,ALN2,A,B,SF,XO,CMRAD,X4,Y4)
00036          XLEN=(X3-X4)/FLOAT(ISCALE)*100.0
00037          YLEN=(Y2-Y1)/FLOAT(ISCALE)*100.0
00038          RETURN
00039          END
00040          SUBROUTINE TMPLXY (PHI,DLAM,A,B,SF,XO,CMRAD,X,Y)
00041     C
00042     C
00043     C
00044     C      SUBROUTINE TMPLXY COMPUTES THE X,Y COORDINATES FOR THE
00045     C    TRANSVERSE MERCATOR PROJECTION GIVEN THE GEOGRAPHIC COORDINATES
00046     C    (LATITUDE,LONGITUDE).  THE EQUATIONS USED TO COMPUTE X AND Y
00047     C    ARE FROM THOMAS (1952). SUBROUTINE MERARC IS USED TO COMPUTE THE
00048     C    MERIDIAN ARC LENGTH
00049     C
00050     C
00051     C
00052     C    INPUT:
00053     C
00054     C          PHI   -  LATITUDE IN RADIANS
00055     C          DLAM  -  LONGITUDE OF POINT MINUS LONGITUDE OF CENTRAL
00056     C                   MERIDIAN (IN RADIANS) FOR LONGITUDE POSITIVE EAST
```

```
00057     C           A     -  SEMI-MAJOR AXIS OF THE REFERENCE ELLIPSOID
00058     C           B     -  SEMI-MINOR AXIS OF THE REFERENCE ELLIPSOID
00059     C           XO    -  FALSE EASTING OF THE CENTRAL MERIDIAN
00060     C           SF    -  SCALE OF THE CENTRAL MERIDIAN
00061     C           CMRAD -  THE CENTRAL MERIDIAN IN RADIANS
00062     C
00063     C
00064     C     OUTPUT:
00065     C           X     -  EASTING COORDINATE OF THE TRANSVERSE MERCATOR
00066     C                    PROJECTION
00067     C           Y     -  NORTHING COORDINATE OF THE TRANSVERSE MERCATOR
00068     C                    PROJECTION
00069     C
00070     C                                WRITTEN BY R. R. STEEVES AND G. BOWIE
00071     C
00072     C
00073           IMPLICIT REAL*8(A-H,O-Z)
00074           SP=DSIN(PHI)
00075           CP=DCOS(PHI)
00076           T=DTAN(PHI)
00077           E=DSQRT((A**2-B**2)/A**2)
00078           ETA=DSQRT((A**2-B**2)/B**2*CP**2)
00079           CALL MERARC(PHI,A,B,SPHI)
00080           DN=A/DSQRT(1.D0-E*E*SP*SP)
00081           X=DN*(DLAM*CP+DLAM**3*CP**3/6.D0*(1.D0-T**2+ETA**2)+DLAM**5
00082          .  *CP**5/120.D0*(5.D0-18.D0*T**2+T**4+14.D0*ETA**2-58.D0*T**2*
00083          .  ETA**2+13.D0*ETA**4+4.D0*ETA**6-64.D0*ETA**4*T**2-24.D0*ETA**6
00084          .  *T**2)+DLAM**7/5040.D0*CP**7*(61.D0-479.D0*T**2+179.D0*T**4
00085          .  -T**6))
00086           Y=SPHI+DN*(DLAM**2/2.D0*SP*CP+DLAM**4/24.D0*SP*CP**3*(5.D0-
00087          .  T**2+9.D0*ETA**2+4.D0*ETA**4)+DLAM**6/720.D0*SP*CP**5*
00088          .  (61.D0-58.D0*T**2+T**4+270.D0*ETA**2-330.D0*T**2*ETA**2
00089          .  +445.D0*ETA**4+324.D0*ETA**6-680.D0*ETA**4*T**2+88.D0*ETA**8
00090          .  -600.D0*ETA**6*T**2-192.D0*ETA**8*T**2)+DLAM**8/40320.D0*SP
00091          .  *CP**7*(1385.D0-3111.D0*T**2+543.D0*T**4-T**6))
00092           X=SF*X+XO
00093           Y=SF*Y
00094           RETURN
00095           END
00096           SUBROUTINE MERARC(PHI,A,B,S)
00097     C
00098     C
00099     C      THIS SUBROUTINE COMPUTES THE MERIDIAV ARC LENGTH FROM THE EQUATOR
00100     C     TO LATITUDE PHI ON AN ELLIPVOID OF REVOLUTION DEFINED BY ITS
00101     C     SEMI-MAJOR AXIS 'A' AND ITS SEMI-MINOR AXIS 'B' .  THE COMPUTED
00102     C     ARC LENGTH IS ACCURATE TO APPROXIMATELY 10 MICROMETRES OVER THE
00103     C     ENTIRE RANGET EQUATOR TO POLE
00104     C
00105     C
00106     C     INPUT:  PHI - ELLIPSOIDAL LATITUDE IN RADIANS (NORTH POSITIVE)
00107     C             A,B - SEMI-MAJOR AND SEMI-MINOR AXIS OF ELLIPSOID
00108     C                   (THE CWMPUTED ARC LENGTH WILL BE IN THE FAME UNITS
00109     C                    AS A AND B)
00110     C
00111     C
00112     C     OUTPUT:  S  - MERIDIAN ARC LENGTH
```

```
00113     C
00114     C                                   WRITTEN BY R. R. STEEVES
00115     C
00116     C
00117           IMPLICIT REAL*8 (A-Z)
00118           E2=(A**2-B**2)/(A**2)
00119           E4=E2*E2
00120           E6=E4*E2
00121           E8=E6*E2
00122           A0=1.0D0-E2/4.D0-3.D0*E4/64.D0-5.D0*E6/256.D0-175.D0*E8/16384.D0
00123           A2=3.D0/8.D0*(E2+E4/4.D0+15.D0*E6/128.D0-455.D0*E8/4096.D0)
00124           A4=15.D0/256.D0*(E4+3.D0*E6/4.D0-77.D0*E8/128.D0)
00125           A6=35.D0/3072.D0*(E6-41.D0*E8/32.D0)
00126           A8=-315.D0*E8/131072.D0
00127           S=A*(A0*PHI-A2*DSIN(2.D0*PHI)+A4*DSIN(4.D0*PHI)-A6*DSIN(6.D0*PHI)
00128             +A8*DSIN(8.D0*PHI))
00129           RETURN
00130           END
```

NAME OF PROGRAM .....CPLOTCL

PURPOSE .....1. GENERATE A 4-COLOR PLOT OF ANY SINGULAR ELEMENT FROM THE DATA LIST USING THE MEAN AND STANDARD DEVIATIONS FROM THE STAT1 PACKAGE.
2. PROVIDES LISTING OF DATA SET.

```
00013    &PRINT OFF NODATA NOINFO
00014    &*
00015    &*  GEOCHEM PLOTTING CLIST
00016    &*
00017    TRANS CAPS
00018    CLEAR
00019         &TYPE ENTER CPU TIME (SECS) AND NUMBER OF LINES (THOUSANDS):
00020         &TYPE DEFAULT IS '10,2'  I.E. 10 SECONDS 2 THOUSAND LINES
00021         &READ 3 7
00022         &IF &L3 = 0 &SET 3 = 10
00023         &IF &L7 = 0 &SET 7 = 2
00024         INPUT
00025         &DATA
00026    //CAKLQD52 JOB '5670,XXXXXXXXXXX',CHANDRA,MSGLEVEL=(1,1)
00027    /*JOBPARM  S=&3,L=&7,NONEWS
00028         &END ESCAPE
00029    STRT:&TYPE ENTER VSPC FILE NAME, MAP SHEET NUMBER, MAP SHEET NAME:
00030         &READ 10 15 17 18
00031         &IF &L10 = 0 &GOTO ERROR1
00032         &IF &L15 = 0 &GOTO ERROR1
00033    LTLN:&TYPE ENTER LAT AND LONG OF LOWER LEFT CORNER
00034         &READ 20 30
00035         &IF &L20 = 0 &GOTO ERROR2
00036         &IF &L30 = 0 &GOTO ERROR2
00037    &* SET VARIABLE LPB TO PLOT ONLY (LPB=2)
00038         &SET 50 = 2
00039    VAL: &TYPE ENTER THE ELEMENT TO BE PLOTTED
00040         &READ 55
00041         &IF &L55 = 0 &GOTO VAL
00042         &IF &55 = CU &SET 55 = 1
00043         &IF &55 = PB &SET 55 = 2
00044         &IF &55 = ZN &SET 55 = 3
00045         &IF &55 = MN &SET 55 = 4
00046         &IF &56 = FE &SET 55 = 5
00047         &IF &55 = CO &SET 55 = 6
00048         &IF &55 = NI &SET 55 = 7
00049         &IF &55 = AG &SET 55 = 8
00050         &IF &55 = MO &SET 55 = 9
00051         &IF &55 = U  &SET 55 = 10
00052         &IF &55 = W  &SET 55 = 11
00053         &IF &55 = SB &SET 55 = 12
00054         &IF &55 < 1 &GOTO ERROR3
00055         &IF &55 > 12 &GOTO ERROR3
00056    MEAN:&TYPE ENTER MEAN AND STANDARD DEVIATION:
```

```
00057          &READ &6 &7
00058          &IF &L&6 = 0 &GOTO MEAN
00059          &IF &L&7 = 0 &GOTO MEAN
00060     SCL: &TYPE ENTER SCALE :
00061          &TYPE DEFAULT IS '20000 '
00062          &READ &0
00063          &IF &L&0 = 0 &SET &0 = 20000
00064          INPUT
00065          &DATA
00066     //   EXEC FORTPLOT,PARM.FORT='NOXREF,NOMAP,LANGLVL(6&)',
00067     //        TYPE=FILEPLOT,RG=256K
00068     //FORT.SYSIN DD *
00069          &END ESCAPE
00070          MER CPLOT1
00071          MER PLOT2
00072          INPUT
00073          &DATA
00074     //GO.SYSIN DD *
00075     &15 &20 &30 &&0 &50 &55 &56 &57
00076     &17 &18
00077          &END ESCAPE
00078          MER &10
00079          INPUT
00080          &DATA
00081     //
00082          &END ESCAPE
00083          &TYPE DO YOU WANT THIS JOB SUBMITTED (Y/N) DEFAULT IS 'Y'.
00084          &READ &0
00085          &IF &L&0 = 0 &SET &0 = 'Y'
00086          &IF &&0  = N &GOTO OUT
00087          SUBMIT
00088     OUT: &TYPE VSPC COMMAND TRANS CAPS HAS BEEN ISSUED
00089     &EXIT
00090     ERROR1: &TYPE INVALID FILE NAME OR MAP NUMBER
00091          &GOTO STRT
00092     ERROR2: &TYPE INVALID NUMBER
00093          &GOTO LTLN
00094     ERROR3: &TYPE INVALID ELEMENT.
00095          &GOTO VAL
```

NAME OF PROGRAM CPLOT1

PURPOSE .....ONE OF TWO MAIN PROGRAMS
WHICH EXECUTES THE COLOR
PLOT. THE OTHER IS PLOT2.

```
00010     C     PLOT
00011           REAL LTMN,LTMX,LNMN,LNMX,LAT,LON,ELMS(12),PLT
00012           INTEGER CLS,P1,PEN
00013           INTEGER*4 ELMNTS(2) /'    ','$E  '/
00014           INTEGER*4 MPNAME(3) /'    ','    ','$E  '/
00015           INTEGER*4 CHRS(12) /'CU  ','PB  ','ZN  ','MN  ','FE% ','CO  ',
00016          .          'NI  ','AG  ','MO  ','U   ','W   ','SB  '/
00017     C
00018     C         LTMN   - MINIMUM LATITUDE OF MAP SHEET
00019     C         LNMN   - MINIMUM LONGITUDE OF MAP SHEET
00020     C         XLEN   - LENGTH OF PLOT IN CENTIMETRES ALNG THE X-AXIS
00021     C         YLEN   - LENGTH OF PLOT IN CENTIMETRES ALNG THE Y-AXIS
00022     C         ISTA   - STATION NUMBER
00023     C         LPB    - LIST,PLOT OR BOTH (1,2 OR 3)
00024     C
00025           PEN=1
00026           READ (5,*) MAP,LTMN,LNMN,ISCALE,LPB,P1,RMEAN,STDEV
00027           READ(5,150) MPNAME(1),MPNAME(2)
00028           LNMN=-LNMN
00029           LNMX=LNMN+0.125
00030           LTMX=LTMN+0.125
00031     C
00032           ELMNTS(1)=CHRS(P1)
00033     C
00034     C         TEST IF DATA IS TO PLOTTED OR LISTED
00035     C
00036        2  IF(LPB.EQ.1) GOTO 5
00037     C
00038     C         CALCULATE MAP BOUNDARIES AND DIMENSIONS
00039     C
00040           CALL MAPSZ(MAP,ISCALE,LTMN-0.02,LTMX,LNMN-0.02,LNMX,XLEN,YLEN)
00041           XLEN=XLEN/2.54
00042           YLEN=YLEN/2.54
00043           CHECK=XLEN+YLEN
00044           IF(YLEN.GT.33.0 .OR. CHECK.LE.0.0 .OR. XLEN.GT.50) GO TO 30
00045     C
00046     C         SET PLOT LIMITS, FRAME AND LABEL MAP SHEET
00047     C
00048           CALL AREA(XLEN,YLEN)
00049           CALL SETPLT(LNMN-0.02,LTMN-0.02,LNMX,LTMX)
00050           CALL AXES(LNMN,LTMN,LNMX,LTMX,LNMX,LTMX,0.01,0.01)
00051           CALL AXES(LNMN,LTMN,LNMX,LTMX,LNMN,LTMN,0.01,0.01)
00052           X1=LNMX+0.002
00053           Y1=LTMX+0.001
00054           CALL NMBR(LNMN,Y1,LNMN,'(F7.3)')
00055           CALL NMBR(LNMX,Y1,LNMX,'(F7.3)')
00056           CALL NMBR(X1,LTMX,LTMX,'(F7.3)')
```

```
00057                CALL NMBR(X1,LTMM,LTMM,'(F7.3)')
00058                X1=LNMM+0.002
00059                Y1=LTMX+0.002
00060                CALL NMBR(X1,Y1,MAP,'('' GEOCHEM MAP ''I4)',0.0,0.3)
00061                X1=LNMM+0.050
00062                CALL CHARS(X1,Y1,ELMNTS,0.0,0.3)
00063                X1=LNMM+0.100
00064                CALL CHARS(X1,Y1,MPNAME,0.0,0.3)
00065                CALL SELPEN(PEN)
00066     C
00067          5     CONTINUE
00068     C
00069     C          READ RECORD AND PLOT IT
00070     C
00071         10     READ(5,130,END=40)
00072               . YR,ISTA,LAT,LON,RX,AGE,CLS,ELMS
00073                IF(LPB .NE. 2 .AND. MOD(ICNT,50) .EQ. 0) PRINT 105,MAP
00074                ICNT=ICNT+1
00075                IF(LPB.NE.2) PRINT 140,
00076               . YR,ISTA,LAT,LON,RX,AGE,CLS,ELMS
00077                IF(LPB .EQ. 1) GOTO 10
00078                ISYM=-CLS
00079                ISTA=MOD(ISTA,1000)
00080                PLT=ELMS(P1)
00081     C
00082     C          SELECT PEN COLOUR
00083     C
00084                IF(PLT.GE.(RMEAN+STDEV)) IPEN=2
00085                IF(PLT.LT.(RMEAN+STDEV)) IPEN=3
00086                IF(PLT.LT.(RMEAN)) IPEN=4
00087                IF(PLT.LT.(RMEAN-STDEV)) IPEN=1
00088                IF(PEN.EQ.IPEN) GOTO 20
00089                PEN=IPEN
00090                CALL SELPEN(PEN)
00091     C
00092         20     IF(LON.GT.LNMX.OR.LON.LT.LNMM) GO TO 35
00093                IF(LAT.GT.LTMX.OR.LAT.LT.LTMM) GO TO 35
00094                CALL SPSYMB(LON,LAT,ISYM)
00095                X1=LON-0.00055
00096                Y1=LAT+0.00025
00097                CALL NMBR(X1,Y1,ISTA,'(I4)',0.0,0.07)
00098                X1=LON-0.0006
00099                Y1=LAT-0.00055
00100                IF(PLT.NE.0) CALL NMBR(X1,Y1,PLT,'(F7.1)',0.0,0.07)
00101                IF(PLT.EQ.0) CALL CHARS(LON,Y1,'NA$E',0.0,0.07)
00102                GO TO 10
00103     C
00104         30     PRINT 100
00105                GO TO 40
00106         35     PRINT 110,ISTA,LAT,LON
00107                GO TO 10
00108         40     IF(LPB.NE.1) CALL ENDPLT
00109                STOP
00110        100     FORMAT(' ',' MAP TO LARGE OR PARAMETERS WRONG')
00111        105     FORMAT('1',///////,'  MAP SHEET ',I4,//'  '
00112               . 'YR  STATION    LAT     LONG   RX TYPE AGE CLASS    CU    PB ',
```

```
00113          .    '   ZN     MM     FE X   CO    NI    AG '.
00114          .    '   MO     U      W    SB './' '.
00115          .    '== ======== ======= ======= ======= === =====   ====  ====',
00116          .    ' ===== ======  ====  ====  ====  ====',
00117          .    '  ====  ====  ====  ====',/)
00118     110       FORMAT(' ',I10,5X,2F10.4,' IS OUTSIDE MAP BOUNDARIES')
00119     130       FORMAT(I2,I7,F7.4,F8.4,3I2,3F4.1,F6.1,F4.2,7F4.1)
00120     140       FORMAT(' ',I3,2X,I7,2F9.4,I5,I7,I5,2X,3F6.1,F8.1,F6.2,7F6.1)
00121     150       FORMAT(A4,A4)
00122               END
```

NAME OF PROGRAM .....PAPEPLOT

PURPOSE .....SUBMITS PLOTTING INSTRUCTIONS TO UNB COMPUTER CENTRE TO EXECUTE PAPER PLOT OF A MAP.

```
00011    &PRINT OFF NODATA NOINFO NONE
00012    &ON ERROR &RESUME
00013    CLEAR
00014    &* BYPASS PROMPT IF 1ST PARAMETER SUPPLIED
00015    &IF &L1 EQ 0 &GOTO PLOTNO
00016    &* SAVE PLOT NUMBER IN TOKEN 13
00017    &SET 13=&1(1,2)
00018    &GOTO JOBNO
00019    PLOTNO: &TYPE
00020            &TYPE ENTER UNBPLOT NUMBER:
00021    &READ 1
00022    &SET 13=&1(1,2)
00023    &IF &L1 EQ 0 &GOTO PLOTNO
00024    JOBNO: &IF &L2 NE 0 &GOTO INPT
00025            &TYPE
00026            &TYPE ENTER JOB NUMBER:
00027            &READ 2
00028    INPT:   &SET 14=&2(1,2)
00029            &IF &L2 EQ 0 &GOTO JOBNO
00030            &IF &L13 EQ 1 &SET 10='0'
00031            &IF &L14 EQ 1 &SET 11='0'
00032          INPUT
00033          &DATA
00034    //CAKLGD62 JOB '5670,XXXXXXXXXXX',CHANDRA,MSGLEVEL=(1,1)
00035    /*SETUP ZETA
00036    /*MESSAGE  PLEASE USE 36 INCH PAPER
00037    // EXEC PLOT,PLOT='UNBPLOT.A&10.&13..CAKLGD&11.&14',PARM='ZETA,FRAME=1'
00038    //
00039           &END ESCAPE
00040    SUBMIT
```

NAME OF PROGRAM .....MYLAPLOT

PURPOSE .....SUBMITS INSTRUTIONS TO THE
UNB COMPUTER CENTRE TO PLOT
MAP ON MYLAR.

```
00010    &PRINT OFF NODATA NOINFO NONE
00011    &ON ERROR &RESUME
00012    CLEAR
00013    &* BYPASS PROMPT IF 1ST PARAMETER SUPPLIED
00014    &IF &L1 EQ 0 &GOTO PLOTNO
00015    &* SAVE PLOT NUMBER IN TOKEN 13
00016    &SET 13=&1(1,2)
00017    &GOTO JOBNO
00018    PLOTNO: &TYPE
00019            &TYPE ENTER UNBPLOT NUMBER:
00020    &READ 1
00021    &SET 13=&1(1,2)
00022    &IF &L1 EQ 0 &GOTO PLOTNO
00023    JOBNO: &IF &L2 NE 0 &GOTO INPT
00024           &TYPE
00025           &TYPE ENTER JOB NUMBER:
00026           &READ 2
00027    INPT:  &SET 14=&2(1,2)
00028           &IF &L2 EQ 0 &GOTO JOBNO
00029           &IF &L13 EQ 1 &SET 10='0'
00030           &IF &L14 EQ 1 &SET 11='0'
00031         INPUT
00032         &DATA
00033    //CAKLGD64 JOB '5678,XXXXXXXXXXX',CHANDRA,MSGLEVEL=(1,1)
00034    /*SETUP ZETA
00035    /*MESSAGE  PLEASE USE  36 MYLAR AND BLACK INK
00036    // EXEC PLOT,PLOT='UNBPLOT.A&10.&13..CAKLGD&11.&14',PARM='ZETA,FRAME=1'
00037    //
00038          &END ESCAPE
00039    SUBMIT
```

FRI, APR. 06, 1984

NAME OF PROGRAM .....STATCL

PURPOSE .....EXECUTES TWO STATISTICAL PACKAGES -STAT1 & STAT2

```
00009    &PRINT OFF NODATA NOINFO
00010    &*
00011    &*  GEOCHEM STATISTICAL ANALYSIS CLIST
00012    &*
00013    TRANS CAPS
00014    CLEAR
00015    STRT:&TYPE ENTER VSPC FILE NAME, MAP SHEET NUMBER, MAP SHEET NAME:
00016         &READ 10 15 17 18
00017         &IF &L10 = 0 &GOTO ERROR1
00018         &IF &L15 = 0 &GOTO ERROR1
00019         &TYPE DO YOU WANT STAT1 OR STAT2 (1/2) ?
00020         &TYPE DEFAULT IS STAT1
00021         &READ 20
00022         &SET 25 = STAT1
00023         &IF &L20 = 0  &SET 20 = 1
00024         &IF &20 = 2 &SET 25 = STAT2
00025         LOAD &25
00026         MER &10
00027         MER SLASH
00028         CH 70 XXYYZZ '&15   &17 &18'
00029    &*
00030         &TYPE DO YOU WANT THIS JOB SUBMITTED (Y/N) DEFAULT IS 'Y'.
00031         &READ 80
00032         &IF &L80 = 0 &SET 80 = 'Y'
00033         &IF &80  = N &GOTO OUT
00034         SUBMIT
00035    OUT: &TYPE VSPC COMMAND TRANS CAPS HAS BEEN ISSUED
00036    &EXIT
00037    ERROR1: &TYPE INVALID FILE NAME OR MAP NUMBER
00038         &GOTO STRT
```

NAME OF PROGRAM STAT1

PURPOSE .....CALCULATES MEAN,MODE,STAN.
DEVIATION, MAX, MIN, RANGE,
QUARTILES,VARIANCE,MEDIAN
AND PLOTS HISTOGRAM FOR ANY
GIVEN DATA SET.

```
00012    //CAKLGD56 JOB '5670,XXXXXXXXXXX',CHANDRA,MSGLEVEL=(1,1)
00013    /*JOBPARM S=20,L=20,R=512
00014    //S1   EXEC  BIMED,PROG=BMDP2D
00015    //SYSIN   DD *
00016    /PROBLEM       TITLE IS 'GEOCHEMISTRY STATISTICAL ANALYSES
00017                          INCLUDES ALL SAMPLES FOR  MAP  SHEET
00018                                XXYYZZ '.
00019    /INPUT         VARIABLES ARE 13.
00020                   FORMAT IS '(6X,F3.0,21X,3F4.1,F6.1,F4.2,7F4.1)'.
00021    /VARIABLE      NAMES ARE STATION,COPPER,LEAD,ZINC,MANGANES,
00022                   IRONPCNT,COBALT,NICKEL,SILVER,MOLYBDEN,URANIUM,
00023                   TUNGSTEN,ANTIMONY.
00024                   BLANKS ARE MISSING.
00025                   LABEL IS STATION.
00026    /END
```

NAME OF PROGRAM STAT2

PURPOSE .....GROUPS A DATA SET INTO TWO
VARIABLES - (1) INORGANIC
(2) ORGANIC
PLOTS HISTOGRAMS FOR EACH
VARIABLE.
COMPUTES MAX , MIN , MEAN ,
STD. DEVIATION FOR EACH
VARIABLE.

```
00015    //CAKLQD58 JOB '5678,XXXXXXXXXXX',CHANDRA,MSGLEVEL=(1,1)
00016    /*JOBPARM S=20,L=20,R=512
00017    //S1  EXEC  BIMED,PROG=BMDP3D
00018    //SYSIN  DD *
00019    /PROBLEM      TITLE IS 'GEOCHEMISTRY STATISTICAL ANALYSES
00020                           ORGANIC VS. INORGANIC SAMPLES
00021                           FOR MAP SHEET  XXYYZZ'.
00022    /INPUT        VARIABLES ARE 14.
00023                  FORMAT IS '(6X,F3.0,19X,F2.0,3F4.1,F6.1,F4.2,
00024                             7F4.1)'.
00025    /VARIABLE     NAMES ARE STATION,CLASS,COPPER,LEAD,ZINC,MANGANES,
00026                            IRON,COBALT,NICKEL,SILVER,MOLYBDEN,
00027                            URANIUM,TUNGSTEN,ANTIMONY.
00028                  BLANKS ARE MISSING.
00029                  LABEL IS STATION.
00030                  GROUPING IS CLASS.
00031    /GROUP        CODES(2) ARE   1,   2.
00032                  NAMES(2) ARE  INORGANIC,ORGANIC.
00033    /END
```

NAME OF PROGRAM .....EXTRACT

PURPOSE .....THIS PROGRAM EXECUTES SUPRDUPR WHICH EXTRACTS A HARD COPY OF ANY DATA SET OR PROGRAM IN THE ACCOUNT LIBRARY.

```
00012  //DNR      JOB '5670,XXXXXXXXXXX',CHANDRA,MSGLEVEL=(1,1)
00013  /*JOBPARM  S=5,L=9,R=256,FORMS=MMLM
00014  //S1 EXEC SUPRDUPR,PARM='L'
00015  //SYSPRINT DD SYSOUT=*
00016  //SYSIN DD DATA,DLM='??'
00017
00018
00019
00020
00021
00022
00023
00024
00025
00026
```

NAME OF PROGRAM .....SLASH

FUNCTION .....MARKS THE END OF A DATA SET AND INSTRUCTS COMPUTER TO GO TO ANOTHER JOB.

```
00035
00036  //
00037
00038
00039
00040
```

NAME OF PROGRAM .....QUES

FUNCTION .....MARKS THE END OF A FILE IN THE EXTRACT (SUPRDUPR) PROGRAM AND INSTRUCTS THE COMPUTER TO GO ON TO ANOTHER JOB.

```
00049
00050
00051
00052  ??
00053
00054
00055
00056
```